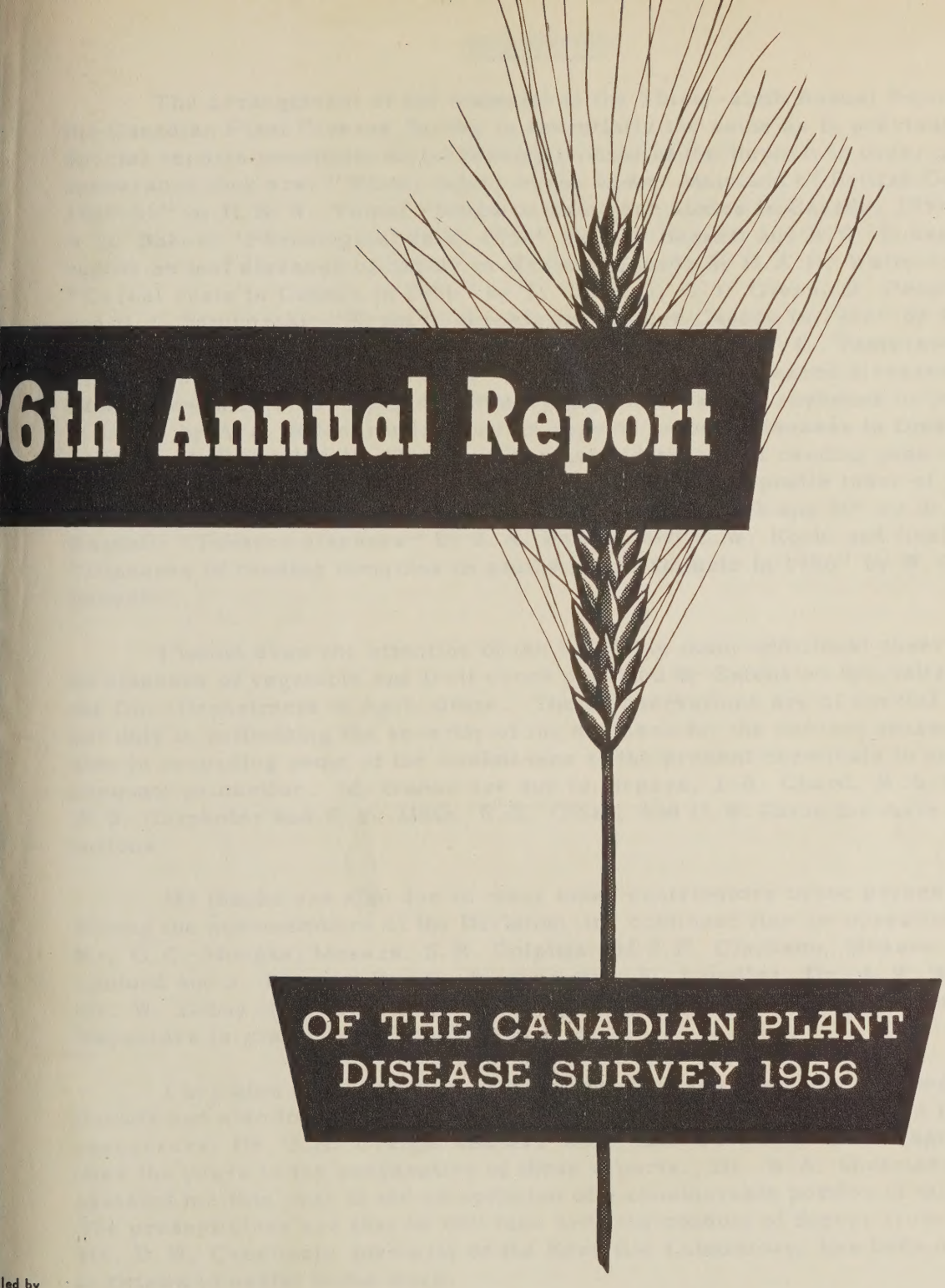

6th Annual Report

OF THE CANADIAN PLANT DISEASE SURVEY 1956

led by

ONNERS, R.A. SHOEMAKER and D.W. CREELMAN

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FOREWORD

The arrangement of the material in the Thirty-sixth Annual Report of the Canadian Plant Disease Survey is essentially the same as in previous years. Special reports constitute an increasing portion of the Report; in order of their appearance they are: "Winter injury in the Lower Mainland of British Columbia, 1955-56" by H.N.W. Toms; "Notes on some nematodes in Canada, 1956" by A.D. Baker; "Phenological data, 1956" by I.J. Bassett and R.C. Russell; a report on leaf diseases of barley in Western Canada by H.A.H. Wallace; "Cereal rusts in Canada in 1956" by T. Johnson, G.J. Green, B. Peturson and D.J. Samborski; "Ergot in cereals in Western Canada in 1956" by R.A. Shoemaker; "Flax diseases in Saskatchewan in 1956" by T.C. Vanterpool; Flax diseases in Manitoba in 1956" by B. Peturson; "Rapeseed diseases in Saskatchewan in 1956" by T.C. Vanterpool; "Diseases of soybeans in Ontario in 1956" by A.A. Hildebrand; separate reports on bean diseases in Ontario by R.L. Millar and R.N. Whitney; reports on diseases of canning peas in Ontario by B.H. MacNeill and of bacterial ring rot and spindle tuber of potato in the Maritimes by D.A. MacLachlan; "Potato viruses S and M" by R.H. Bagnall; "Tobacco diseases" by Z.A. Patrick and L.W. Koch; and finally "Diseases of canning tomatoes in southwestern Ontario in 1956" by W.G. Benedict.

I would draw the attention of the reader to many additional observations on diseases of vegetable and fruit crops provided by Extension Specialists of the Ont. Department of Agriculture. Their observations are of special interest not only in estimating the severity of the diseases for the current season but also in recording some of the weaknesses of the present chemicals in providing adequate protection. My thanks are due to Messrs. J.R. Chard, W.S. Babbitt, W.S. Carpenter and E.F. Muir, R.E. Class, and G.W. Eaton for their contributions.

My thanks are also due to many other contributors to the present report. Among the non-members of the Division, the continued fine co-operation of Mr. G.C. Morgan; Messrs. S.R. Colpitts and S.F. Clarkson, Messrs. D. Leblond and J. Ringuet; Dr. E. Jacques; Mr. E. Lavallee, Dr. A.W. Henry; Mr. W. Lobay; Mr. W.R. Foster; Mr. N. Mayers; and the District Potato Inspectors is gratefully acknowledged.

I beg also at this time to express my thanks to the plant pathologists in Canada and also to Dr. H.T. Gussow, former Dominion Botanist, and his successors, Dr. J.H. Craigie and Dr. W.F. Hanna for their encouragement over the years in the preparation of these reports. Dr. R.A. Shoemaker has assisted me this year in the compilation of a considerable portion of this Report. The present plans are that he will take over the conduct of Survey from now on. Mr. D.W. Creelman, formerly of the Kentville Laboratory, has been moved to Ottawa to assist in the work.

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17 July 1957
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New and Noteworthy Diseases

The cereal rusts were exceedingly light in Western Canada in 1956. Air-borne rust spores were much less numerous than they have been for many years. Moreover, almost the entire wheat and oat acreage in Man. and eastern Sask. was sown to rust-resistant varieties. However, some leaf and stem rust development occurred in Alta. where an occasional field of wheat was severely infected and suffered some damage from stem rust.

Common root rot (Helminthosporium sorokinianum and Fusarium spp.) appeared to be fairly general on wheat throughout the Prairie Provinces. In Sask., where the disease was studied most intensively, it appeared to have caused little loss because growing conditions favored recovery of the crop from the initial stunting effects of the disease. Speckled leaf blotch (Septoria spp.) was again widespread on wheat in Western Canada but infection was generally light and yield losses resulting from leaf destruction probably insignificant. In 2 fields of winter wheat in Alta. trace infections of a bunt that microscopically resembled dwarf bunt were found. However, when the spores were germinated, they were found to germinate like those of common bunt. This experience emphasizes the need for great care in the diagnosis of even conspicuous pathogens. Scald (Rhynchosporium secalis) is the most important leaf disease of barley in Alta. and is increasing in severity in the northern parts of the province, where the barley acreage has been expanding.

A disease, not unlike crown bud rot that has been known on alfalfa for several years in Alta., was reported to be serious on alfalfa and red clover in Ont. Although flax rust is rarely encountered in the principal flax growing sections of Man. and Sask. because rust resistant varieties are almost exclusively sown, rust is causing severe losses in the Peace River district of Alta., where only early maturing (susceptible) varieties can be successfully grown. Observations on the rapidly expanding rapeseed acreage in Sask. indicate that diseases may soon become a factor in its production. The relative importance of the various diseases is still unknown, but the seed-borne pathogen, Alternaria brassicae was shown to be the cause of a common black spot on stems and pods. A root and stalk rot of soybeans, caused by an undetermined species of Phytophthora and first noticed in s.w. Ont. in 1954, was widespread and caused considerable damage in the area in 1956. Harosoy, a popular variety, is completely susceptible to the new disease. Leaf mottle, a disease of sunflowers and first described in 1948 (P.D.S. 28:32) from Man., has now been shown to be caused by Verticillium alboatrum (W. E. Sackston, W. C. McDonald and John Martens. Plant Dis. Reptr. 41:337-343. 1957). The disease causes a premature ripening and less frequently a wilting of the plant. The pathogen is known to cause wilt in potatoes and tomatoes in Man.

Bacterial ring rot (Corynebacterium sepedonicum) continues to be a problem in the growing of potatoes in Canada. Actual losses from the disease

in commercial potato growing areas are apparently insignificant, but under the present cultural practices this low level is being achieved only by constant supervision. Because of the limited success in stamping out ring rot, the various means by which the disease may spread as well as the effectiveness of present control practices are being reinvestigated.

In Canada as a whole, late blight (Phytophthora infestans) was less destructive than usual. Some reduction in yield occurred on Vancouver Island as a result of early defoliation of the vines. On the prairies vine symptoms were inconspicuous, but small amounts of tuber rot were relatively common. Late blight was more prevalent in s. Ont. than for many years, moisture and temperature being near optimum for long periods; losses were considerable. In contrast, late blight caused little damage in the Maritimes, notably in P.E.I. The disease appeared quite early but before mid-August cool, relatively dry weather allowed only slow spread. By digging time unsprayed fields were defoliated and most others were killed down by frost or a chemical vine killer. As a result, little tuber rot developed.

The report of Dr. R.H. Bagnall on potato viruses S and M underlines the difficulties of determining whether one or more viruses may be responsible for the symptoms observed. Undoubtedly one of the greatest difficulties is the finding of suitable screening and differential hosts. The finding of such hosts seems largely a matter of trial and error. Serological techniques, however, are providing an additional tool by which it may be determined whether or not, in the absence of symptoms, a virus has been transmitted. The studies of Dr. B.H. MacNeill on tomato streak reported in this Report emphasize the necessity of considerable experimentation before mixed infections can be accurately diagnosed.

The disease situation in the dry bean crop in s.w. Ont. has occasioned concern in recent years. Surveys of the crop by Dr. R.N. Wensley in the last two years have revealed that root rot is prevalent in the area. However, the predominant pathogen isolated from affected plants in 1955, a hot, dry year, was Fusarium oxysporum whereas in 1956, a cool, very wet season, it was F. solani f. phaseoli. During a later survey in 1956, Dr. R.L. Millar found that anthracnose (Colletotrichum lindemuthianum) was very prevalent on dry beans. When isolations from diseased material were tested on the standard differentials, the isolations all proved to be the alpha strain. Parallel isolations from snap beans grown in the Port Hope area yielded only the beta strain.

This year's observations on club root emphasize the fact that the disease is gradually spreading in Canada. In Quebec, club root is not only prevalent in the Montreal market garden area, but it was also recorded on turnip from 2 towns above Quebec City along the St. Lawrence River, from 2 smaller places in the Eastern Townships and from the northern mining town of

Rouyn in western Quebec. A striking illustration of its rapid spread once the disease is introduced into an area has been provided by Dr. O.T. Page. Club root was first observed in one field of cauliflower on the Bradford Marsh, Ont., in 1953. Next year it was found in another field on the same farm. In the fall of 1954 as a result of hurricane Hazel the entire marsh was flooded. In 1956 club root was found in most fields of cabbage and cauliflower examined, some fields being 5 miles from the originally affected field. Cercospora leaf spot (C. carotae) appears to be a well-established disease in market garden areas in Ont. and Que., where this year it was quite prevalent. Bacterial blight (Pseudomonas apii) of celery was apparently prevalent in the Bradford Marsh, Ont. Canker (Itersonilia perplexans Derx) is a new disease of parsnip reported here for the first time in Canada; it is known from 3 farms near Dixie, Peel Co., Ont.

As a result of a detailed survey of the commercial canning pea areas in Ont. for the last 2 years, Dr. B.H. MacNeill reports that root rot was responsible for the complete loss of several large fields in 2 districts and for serious reductions of yield in many other plantings. Pythium ultimum appeared to be the major pathogen early in the season and Fusarium solani in the later part. A species of Fusarium associated with a vascular disease similar to near wilt was also present. Virus diseases are also important as they caused 20 per cent of the acreage in one district to be abandoned in 1956. One serious outbreak of leaf and pod spot (Ascochyta pisi) was seen in 1956.

Bacterial spot (Xanthomonas vesicatoria) was unusually sev. on peppers in s. Ont. Tomato anthracnose (Colletotrichum phomoides) has become a very troublesome disease in the canning crop in Ont. Spraying does not appear to offer a practical solution because when spraying is stopped as the harvest begins the disease rapidly builds up to destructive proportions.

Fire blight (Erwinia amylovora) was unusually prevalent in the Prairie Provinces, particularly Man. on apples and crabapples and in s. Ont. on apples and pears. The use of organic fungicides against scab (Venturia inaequalis) has resulted in a noticeable increase of powdery mildew (Podosphaera leucotricha) in Ont. Apple scab was not particularly difficult to control in well-sprayed orchards, but failure to maintain good coverage resulted in considerable loss from late season infections. Leaf pucker is a new virus disease of apple first found at Summerland, B.C., in 1954; certain other disorders, possibly of virus origin, are under investigation. Pear blight (Venturia pirina) was rather prevalent in Ont.; recent outbreaks on Bartlett rather suggest the occurrence of physiologic races. Brown rot (Monilinia fructicola) was unusually heavy on sweet cherries in the Kootenays, B.C. Both blossom blight and brown rot were prevalent in the Niagara Peninsula. Indeed, brown rot was destructive to peaches throughout Ont. Although previously unreported to the Survey, bacterial spot (Xanthomonas pruni) appears to be a disease of some importance on peach in s.w. Ont. A survey of the raspberry plantations in Ontario revealed

that anthracnose (Elsinoe veneta) has become a disease of considerable importance which apparently can only be kept in check by a regular spray program. One must also infer that the newer varieties now grown commercially are more susceptible than those cultivated earlier.

Of the diseases of trees and shrubs, the following new records may be noted: Fusicoccum abietinum Prill. & Del. was found causing a twig canker on Abies balsamea in N.B. A new North American record is Trochila ilicis (Chev.) Rehm on leaves of Ilex aquifolium at Victoria, B.C. Gymnosporangium bermudianum Earle, a new rust for Canada, was found on a new host, Juniperus horizontalis, in Bruce Co., Ont.

Among diseases of ornamental plants, the rust Cumminsiella mirabilissima on Mahonia aquifolium deserves special mention. As a result of nursery surveys in Ont. and Que. this rust now appears to be established in these provinces. It was first observed at Ste. Anne de la Pocatiere, Que. in 1949 (P.D.S. 49:107). Since then it has been frequently observed on intercepted material from plants imported from Holland and Belgium and fears (P.D.S. 33:119) were expressed that if importations were continued from western Europe, the rust would soon become established. How serious a pest the rust will prove cannot yet be determined but it may well discourage the future growing of this attractive shrub.

Maladies nouvelles ou d'importance

Les rouilles des céréales ont été extrêmement légères dans l'Ouest canadien en 1956. Les spores de rouille transportées par le vent ont été beaucoup moins nombreuses qu'elles ne l'avaient été depuis plusieurs années. De plus, presque toute la superficie en blé et en avoine au Manitoba et dans l'est de la Saskatchewan a été ensemencée en variétés résistantes à la rouille. Cependant, on a constaté un peu de rouille des feuilles et de rouille de la tige dans l'Alberta où par-ci, par-là se voyaient des champs de blé gravement atteints de rouille de la tige.

La pourriture commune des racines (Helminthosporium sorokinianum et Fusarium spp.) a semblé passablement généralisée sur le blé dans toutes les provinces des Prairies. En Saskatchewan, où l'on a étudié plus à fond la maladie, on a trouvé qu'elle n'avait entraîné que peu de pertes parce que les conditions de croissance ont favorisé le rétablissement de la culture après un début chétif dû à la maladie.

La septoriose des feuilles (Septoria spp.) a été de nouveau très répandue sur le blé dans l'Ouest canadien, mais l'infection a été légère en général et les diminutions de rendement dues à la destruction des feuilles ont probablement été insignifiantes. En Alberta, on a trouvé dans deux champs de blé d'hiver des traces d'infection par une carie qui ressemblait microscopiquement à la carie naine. Cependant, à la germination des spores, on a trouvé qu'elles germaient comme celles de la carie commune. Cela montre qu'il faut apporter beaucoup de soin dans le diagnostic des organismes pathogènes, même s'ils sont faciles à déceler. L'échaudage (Rhynchosporium secalis) est la plus importante maladie du feuillage de l'orge en Alberta et elle s'aggrave dans les parties nordiques de la Province, où la superficie en orge s'est accrue.

On a signalé qu'une maladie peu différente de la pourriture des bourgeons de la couronne et connue depuis déjà plusieurs années sur la luzerne en Alberta s'était attaquée sérieusement à la luzerne et au trèfle rouge en Ontario. Bien que la rouille du lin se rencontre rarement dans les principaux secteurs de culture linière du Manitoba et de la Saskatchewan du fait qu'on y cultive presque exclusivement des variétés résistantes à la rouille, la rouille du lin cause des pertes graves dans la région de Rivière-à-la-Paix (Alb.), où l'on ne peut cultiver avec succès que des variétés à maturation précoce et toutes sujettes à la rouille. Des observations sur la navette dont la culture s'étend rapidement en Saskatchewan indiquent que les maladies peuvent bientôt devenir un facteur qui en limite la production. On ne connaît pas encore l'importance relative des diverses maladies, mais on a trouvé que l'organisme pathogène porté par la semence, Alternaria brassicae, est la cause d'une tache noire commune sur les tiges et les gousses. Une pourriture des racines et du pied des sojas, causée par une espèce indéterminée de Phytophthora et d'abord observée dans le sud-ouest de l'Ontario en 1954, était très répandue et a causé beaucoup de

dommages dans la région en 1956. La populaire variété Harosoy est tout à fait sujette à la nouvelle maladie. La marbrure des feuilles, maladie du tournesol d'abord décrite en 1948 (P.D.S. 28:32) au Manitoba, est maintenant attribuée à Verticillium alboatrum (W.E. Sackston, W.C. McDonald et John Martens. Plant Dis. Reptr. 41: 337-343. 1957). La maladie fait mûrir la plante avant le temps et la fait moins fréquemment flétrir. On sait que l'organisme pathogène cause la flétrissure des pommes de terre et des tomates au Manitoba.

La pourriture du cerne (Corynebacterium sepedonicum) continue d'être un problème dans la culture des pommes de terre au Canada. Les pertes réelles dues à la maladie dans les régions où la pomme de terre se cultive à l'échelle commerciale sont apparemment insignifiantes, mais selon les méthodes actuelles de culture, ce n'est qu'au prix d'une surveillance constante que se maintient ce niveau bas. Vu le peu de succès dans l'élimination de la pourriture du cerne, on réexamine les divers moyens de dissémination de la maladie ainsi que l'efficacité des méthodes de lutte en vigueur.

Dans le Canada pris comme un tout, le mildiou (Phytophthora infestans) a été moins destructeur que d'habitude. Il y a eu une certaine réduction du rendement dans l'Ile de Vancouver par suite d'une défoliation précoce des tiges. Dans les Prairies, les symptômes étaient peu perceptibles sur le feuillage, mais on a trouvé assez souvent de petites quantités de tubercules pourris. Dans le sud de l'Ontario, le mildiou a été plus répandu qu'il ne l'avait été depuis nombre d'années, du fait que la température et l'humidité ont été presque optimums durant de longues périodes; les pertes ont été considérables. Par contre, le mildiou a causé peu de dégâts dans les Maritimes, particulièrement dans l'I.P.E. La maladie s'est manifestée très tôt, mais avant la mi-août, un temps relativement sec et frais ne lui a permis de se répandre que lentement. Au temps de l'arrachage, les feuilles étaient tombées dans les champs non arrosés alors que dans la majorité des autres champs le froid ou les herbicides avaient détruit les tiges. En conséquence, il ne s'est produit que peu de pourriture des tubercules.

Le rapport de M. R.H. Bagnall sur les virus S et M des pommes de terre marque combien il est difficile de déterminer si un seul virus ou plusieurs peuvent être responsables des symptômes observés. L'une des plus grandes difficultés consiste sans doute à trouver des plantes-écrans convenables et des hôtes différentiels appropriés. La découverte de pareils hôtes semble être surtout une affaire de tâtonnage. Les techniques sérologiques, toutefois, représentent d'autres moyens de déterminer si oui ou non, en l'absence de symptômes, un virus aurait pu se transmettre. Les études de M. B.H. MacNeill sur la strie des tomates, étude incluse dans le présent rapport, souligne la nécessité d'expérimentation considérable avant qu'on puisse diagnostiquer avec justesse des infections mixtes.

Dans le sud-ouest de l'Ontario, les maladies ont rendu problématique la culture des haricots secs. Des enquêtes sur la situation par M. R.N. Wensley au cours des deux dernières années ont révélé que la pourriture des racines est la maladie prédominante dans cette région. Cependant, l'organisme pathogène le plus souvent isolé en 1955, saison chaude et sèche, a été le Fusarium oxysporum, alors qu'en 1956, année fraîche et très humide, c'est le F. solani f. phaseoli qu'on a le plus souvent isolé des plantes malades. Au cours d'une enquête ultérieure en 1956, M. R.L. Millar a trouvé que l'anthracnose (Colletotrichum lindemuthianum) était très répandue sur les haricots secs. Lorsqu'on a éprouvé sur des hôtes différentiels réguliers des cultures isolées de plantes malades, toutes ces cultures ont paru appartenir à la souche alpha. Par ailleurs, des cultures isolées de haricots verts cultivés dans la région de Port Hope étaient toutes de la lignée beta.

Les observations de cette année sur la hernie des crucifères montre que la maladie se répand graduellement au Canada. Dans le Québec, la hernie n'abonde pas seulement dans la région maraîchère de Montréal, mais on l'a aussi signalée sur le navet dans deux villes en haut de Québec, le long du fleuve St-Laurent, à deux petites localités dans les Cantons de l'est et dans la ville minière de Rouyn dans l'ouest de Québec. M. O.T. Page a bien illustré la rapidité avec laquelle la maladie se répand après qu'elle s'est introduite dans une région. La hernie a d'abord été observée en 1953 dans un champ de choux-fleurs à Bradford-Marsh (Ont.). L'année suivante, on l'a trouvée dans un autre champ sur la même ferme. Durant l'automne 1954, tout le terrain bas (Marsh) fut inondé à la suite du passage de l'ouragan Hazel. En 1956, on a trouvé la hernie dans la majorité des champs de choux et de choux-fleurs examinés, certains champs se trouvant à cinq milles de distance du champ atteint en premier lieu. La tache Cercospora des feuilles (C. carotae) paraît être une maladie bien établie dans les régions maraîchères de l'Ontario et du Québec, où elle a été tout à fait abondante cette année. La brûlure bactérienne (Pseudomonas apii) du céleri a semblé très fréquente dans le Bradford-Marsh (Ont.). Le chancre (Itersonilia perplexans Derx) est une nouvelle maladie du panais dont nous faisons ici la première mention pour le Canada; on l'a dépistée sur trois fermes près de Dixie, comté de Peel (Ont.).

A la suite d'une enquête détaillée conduite au cours des deux dernières années dans les régions à pois de conserves de l'Ontario, M. B.H. MacNeill rapporte que la pourriture des racines a ruiné plusieurs grands champs de pois dans deux régions et qu'elle a réduit de beaucoup les rendements dans plusieurs autres plantations. Le Pythium ultimum a paru être le principal agent pathogène au début de la saison et le Fusarium solani vers la fin. Une espèce de Fusarium associés à une maladie vasculaire semblable à la demi-flétrissure était aussi présente. Les maladies à virus sont également importantes vu qu'elles ont causé en 1956 dans une région l'abandon de 20 p. 100 de la superficie en tomates. Il a noté aussi en 1956 un cas grave de la tache des feuilles et des gousses (Ascochyta pisi).

La tache bactérienne (Xanthomonas vesicatoria) a été exceptionnellement grave sur le piment dans le sud-ouest de l'Ontario. L'anthracnose des tomates (Colletotrichum phomoides) a causé beaucoup d'ennuis dans la culture des tomates de conserves de l'Ontario. La pulvérisation ne semble pas offrir une solution pratique, parce que dès qu'on cesse d'arroser au début de la récolte la maladie progresse rapidement et fait de graves dégâts.

La brûlure bactérienne (Erwinia amylovora) a été exceptionnellement abondante dans les provinces des Prairies, particulièrement au Manitoba sur les pommiers et les pommetiers et dans le sud de l'Ontario sur les pommiers et les poiriers. L'emploi de fongicides organiques contre la tavelure (Venturia inaequalis) a entraîné une augmentation notable de blanc (Podosphaera leucotricha) en Ontario. La tavelure du pommier n'a pas été particulièrement difficile à tenir en échec dans les vergers où les arrosages étaient bien faits, mais lorsqu'on n'a pas bien recouvert tout le feuillage, les infections tardives ont entraîné beaucoup de pertes. La bosselure des feuilles est une nouvelle maladie à virus du pommier d'abord trouvée à Summerland (C.-B.) en 1954; on fait des recherches sur certains autres désordres qui sont peut-être dus à des virus. La brûlure du poirier (Venturia pirina) était plutôt abondante dans l'Ontario; des cas récents de cette maladie sur la Bartlett portent à croire qu'il en existe des races physiologiques. La pourriture brune (Monilinia fructicola) a été exceptionnellement abondante sur les cerisiers à cerises douces dans les Kootenay (C.-B.). La brûlure des fleurs et la pourriture brune sévissaient également dans la péninsule de Niagara. De fait, la pourriture brune a causé de graves dégâts chez les pêches dans tout l'Ontario. Bien qu'elle n'ait pas encore été signalée dans ces Rapports, la tache bactérienne (Xanthomonas pruni) paraît être une maladie de quelque importance sur le pêcher dans le sud-ouest de l'Ontario. L'enquête sur les framboisières de l'Ontario a révélé que l'anthracnose (Elsinoe veneta) est devenue une maladie d'importance considérable et qu'on ne peut apparemment la tenir en échec qu'en exécutant un bon programme de pulvérisations. On peut aussi penser que les nouvelles variétés présentement cultivées à l'échelon commercial sont plus sujettes que celles qu'on cultivait auparavant.

Parmi les maladies des arbres et des arbustes, notons les suivantes, qui constituent de nouvelles mentions: Fusicoccum abietinum Prill.& Del. a causé un chancre des rameaux sur l'Abies balsamea au N.-B. Une nouvelle mention pour l'Amérique du Nord est le Trochila ilicis (Chev.) Rehm sur les feuilles d'Ilex aquifolium à Victoria (C.-B). Le Gymnosporangium bermudianum Earle, rouille nouvelle au Canada, a été trouvée sur un hôte nouveau pour elle, le Juniperus horizontalis, dans le comté de Bruce, en Ontario.

Parmi les maladies des plantes ornementales, la rouille Cumminsiella mirabilissima sur le Mahonia aquifolium mérite une mention spéciale. A la suite d'enquêtes dans les pépinières en Ontario et dans Québec, cette rouille

paraît maintenant établie dans ces provinces. Elle a été d'abord observée à Ste-Anne-de-la-Pocatière (Québec) en 1949 (P.D.S. 49:107). Depuis lors, on l'a souvent observée sur des plantes confisquées importées de Hollande et de Belgique et l'on a exprimé la crainte (P.D.S. 33:119) que si l'on continue à importer de ces plantes de l'ouest de l'Europe, la rouille s'établisse prochainement. On ne peut pas encore déterminer jusqu'à quel point cette rouille peut être dommageable mais il est bien possible qu'elle fasse un jour disparaître de nos jardins cet arbuste gracieux.

The Weather and Its Influence on Plant Disease

After the severe freeze of 10-18 Nov., the weather on the lower mainland of B.C. was relatively mild in December but with some snow. Frosts occurred in January, February and March with less sun and more snow than usual, the last spring frost occurring on 18 March. April and May were sunny with little rain. May was a record month for sunshine and on the 30th the temperature rose to 81°F. It was also possible to set out ornamental annuals from the middle of the month. June was cooler with a higher rainfall and less sun than usual, all of which delayed ripening of strawberries in the few plantings which had survived the November freeze.

July, August and September were warmer and sunnier than usual with little rain. Bean rust was severe in all Lower Fraser Valley areas, but no reduction in yield was reported. All crops showed the effects of 2 1/2 months without rain - lawns browned, less grass on farm pastures, and plants injured in November continued to die all summer. Late blight infection was slight on potatoes until late August and little or no reduction in yield occurred. After mid-September temperatures were below normal, sunshine was low and rainfall high. A record rain of 2.35 in. in 24 hours occurred 18-19 Oct. and the first frost on 28 Oct. November and December were cooler than usual with some very heavy rains in November. The first snow fell on 4 Dec. (H.N.W. Toms).

Two periods of extreme temperature during the 1955-56 winter caused sev. damage to horticultural crops in the B.C. Interior. On 11 Nov., when many orchard trees, especially late apple varieties, were not yet dormant, the temperature dropped 33° within 20 hours. The drop continued to a minimum of -2°F. at Summerland on 12 and 13 Nov., and remained close to zero until 17 Nov. On 15 and 16 Feb. minimum temperatures of -8° and -6°F. were reached at Summerland. Lower temperatures were recorded in other districts.

Many thousands of orchard trees were killed by the combined effects of the two cold periods. Trunk and crotch injury to late apple varieties and stone fruit trees, especially cherries, resulted in loss of trees in all districts of the Okanagan Valley, and in the Creston Valley. Spur and bud injury reduced crops on large numbers of trees that were not killed.

Strawberries and garden perennials also suffered severely. Damage was especially serious in garden roses and many ornamental shrubs and trees.

The spring and summer of 1956 were almost ideal. Temperatures were above the 39-year average for all months between April and November, except June. Rainfall was almost nil in April and May, higher than average in June and July, normal in August, and much below average in September, October and November.

During the dry spring months apple scab did not become established. Light infections occurred in some districts in June and July, but the disease caused no economic loss. Records show that apple powdery mildew incidence is low after extremely cold winters. The disease was not found in Okanagan Valley orchards in 1956.

Brown rot in sweet cherry fruits was unusually sev. throughout the West Kootenays, occasioning heavy claims on shipments to Prairie markets. Presumably the wet weather in June and July favored its development. Symptoms of western X-disease of peach have not been apparent in Okanagan Valley orchards during the last cool wet summers. Even trees known to have been diseased in earlier years have shown no symptoms. Spot surveys of several orchards in 1956 revealed that some of these trees were again showing symptoms. Hot summer weather is presumed to be necessary for sympton expression.

Most diseases of vegetables caused less than normal damage in 1956. However, stem rot of beans became sev. during the moist period in June (M.F. Welsh).

In S. Alta., the winter was unusually long and severe. Snow and record-breaking low temperatures persisted from the early part of Nov. into March without an appreciable break. Snow persisted into April. Significant winter-killing occurred in winter wheat test plots at Lethbridge and in other fields in the Lethbridge area for the first time in several years. The scarcity of wheat streak mosaic this year may have been partly due to failure of vector-harboring volunteer winter wheat plants to survive the winter. Snow mold damage was more prevalent in forage crops and lawns than in 1955. Above normal precipitation in July and August appears to have aided in the development of stem rust on winter wheat and soft white spring wheat in Alta. Although damage to yield was not great in winter wheat the rust did materially reduce yield of soft white spring wheat (E.J. Hawn).

In central and n. Alta. the autumn of 1955 was warm and open during September and October, with only 5 nights of freezing temperatures before 25 Oct. On 30-31 Oct. there fell 7 inches of snow which largely melted away one week later. Between 10 and 11 Nov. the temperature dropped from 38° to -11°F. Subzero weather without appreciable snow cover lasted until 12 Dec. when about 2 1/2 in. of snow fell. This weather pattern did not allow the herbaceous perennials to harden off and many died during the record cold winter.

April and May, 1956, were very dry, and this drought was not broken until 15-16 June when a 2 in. rain was recorded. The dry spell was possibly responsible for the low level of ergot infection. After 15 June the summer was warm with considerable rain; very good conditions for crop growth. Barley was subjected from a very early stage to conditions which were ideal for scald development.

Wheat stem rust spores arrived fairly early and farmers who were growing susceptible varieties such as Red Bobs suffered appreciable loss (W.P. Campbell).

Sev. frosts for several days after the snow had melted in the spring caused serious damage to experimental plots of grasses and legumes at Saskatoon, Sask. Cold wet weather and flooding persisted in many areas and general seeding was the latest on record. By 7 June, however, the weather turned dry and temperatures were high. These conditions left the top soil dry in large areas and germination was uneven. Continuing dry weather in s.w. Sask. caused wheat to head out on short straws. Moisture conditions, however, improved in most of the province and growth was rapid.

The first stem rust of wheat was found in the Saskatoon area on 12 July and leaf rust in the Landis area (w. central Sask.) on 19 July. Both rusts developed slowly during the relatively dry weather and little damage was done.

Cold injury to sweet clover in the spring was followed later by a root and crown rot caused by Fusarium spp.; it caused the death of many plants in the breeding nursery at Saskatoon. Leaf spots were abundant on legumes, grasses and cereals. Killing frosts in late August caused sev. damage to cereal, flax and rapeseed over a large area. Intermittent rainfall during harvest lowered quality of crops especially cereals (H.W. Mead).

Periods of bright sunshine lasting 12-15 hours on several days in June when temperatures reached 80-97°F. probably provided the conditions for heat banding of cereals and heat canker of flax. The critical days at Saskatoon for cereals were 1, 4, 8, 9 June and for flax 8-10, 19-20 June (T.C. Vanterpool).

Owing to very heavy snowfall (all-time record of about 99 inches) throughout Man. in 1956 and an abnormally cool spring, seeding of small grains was about 2 weeks later than normal. Temperatures were about 6°F. above normal for June, 3°F. below normal for July and about normal for August throughout most of the agricultural area. At the same time June precipitation was about 30% in excess of normal; July precipitation was 15% above normal over the whole province; and August precipitation was about 150% above normal in the Red River Valley and about 30% below normal in the other parts. Despite the moderately favorable weather conditions for rust development in Man. throughout most of the growing season, cereal rusts were much less prevalent than usual in 1956. The scarcity of cereal rusts may be attributed, at least partly, to the small amount of air-borne rust inoculum, particularly in early spring, as a result of excessively dry weather in the southern U.S.A. in the early part of 1956. Apparently the course of rust development in Western Canada in 1956, was affected to a greater extent by the weather which prevailed in the southern U.S.A. during the winter and spring of 1956 than by the weather which prevailed in Western Canada during the growing season (B. Peturson).

In s.w. Ont. the early spring season was one of the coolest and wettest on record. After a brief hot spell of one week in mid-June cool wet weather returned and prevailed for the remainder of the summer and early autumn. October was an exceedingly warm month with very low precipitation. The low temperatures to which the early cabbage and cauliflower crops were exposed in April in Essex county caused approximately 80% bolting in the latter crop. Prolonged cool weather in late May and in early June predisposed to severe root rot cucumbers and muskmelons that were set in the field under paper and hot caps. Frequent rain showers during May favored development of early blight and some Septoria leaf spot in the tomato plant beds in Essex county. A continuation of this weather in June and July led to a heavy infection of bacterial leaf spot in sweet pepper crops. Although throughout the entire summer and fall weather conditions appeared to be most favorable for a late blight epidemic in tomatoes, no blight was observed in s.w. Ont. (C.D. McKeen).

In the Niagara peninsula the growing season was featured by much cool wet weather. In May 5.26 in. of rain fell on 17 days, the 2nd highest amount recorded in 25 years at St. Catharines. The mean maximum and minimum temperatures with several periods of sharp frosts were also below the 25-year means. As a result development of tree fruits was late and growth slow. Strawberries suffered 10-15% frost damage on 8 May and grapes an estimated 20% injury from low temperatures on 24-25 May. Cool overcast conditions during bloom resulted in almost complete failure of the sweet cherry crop and greatly reduced fruit set of some varieties of peaches and prunes.

Apple scab got off to a good start during a 72-hour wet period 27-29 April. At this time apple buds were green-tipped and primary ascospore discharge was recorded during the rain period. The fact that much of the infection recorded on the fruit at harvest was sepal infection suggested that it occurred at this period. Primary scab lesions were first observed on 21 May. Secondary lesions were present on 4 June and fruit infections on unsprayed trees on 8 June. Rainfall was excessive in both July and August. In August particularly scab was actively spreading to terminal growth and late scab lesions developed on the fruit. Pin-point scab is expected to develop in storage.

Powdery mildew was extremely heavy in the laboratory orchard. First observed on 15 May it caused marked delay in growth of terminals infected in 1955 and greatly stunted and weakened infected fruit buds. Such clusters failed to open. The mildew developed rapidly to overrun the terminal leaf growth and continued in epidemic proportions all summer. In the drier, warmer season of 1955 mildew was quite prevalent but not nearly as general and severe as in 1956.

On stone fruits the brown rot situation at the blossom stage was of particular interest. Apothecia were first observed on 14 May following a succession of wet days. On 15-16 May a 13-hr. wet period occurred when trees

were in partial to full bloom. This was considered a critical infection period. The weather turned quite cool and the infection progressed slowly. On 21-22 May a shorter infection period occurred but accompanied by higher temperatures. By 21-22 May much of the infection had progressed to form twig cankers and caused die-back. Sporulation on blighted blossoms and cankered twigs became heavy. Infection of apricot bloom was specially common. In the orchards rot on developing fruit was more common than usual because of wet weather in July and August and increased insect damage. Conditions were very favorable for rot development and abundant sporulation; continued damp weather and weathering of spray residues by rain were factors contributing to the prevalence of rot in the harvested fruit of early and mid-season peach varieties. It was a season in which the value of the pre-harvest or pre-pick spray applications was clearly evident.

Heat spot and drought spot of Italian prunes was a widespread disorder. Unexpectedly the disease was very prevalent in a season when neither heat nor drought conditions existed to any marked degree. However, reports of its occurrence were received early in August following one of the few times during the summer when the temperature reached 88°F. and the weather had been dry for 10 days. This was broken by a week-end of rain. A light crop may also have contributed to the prevalence of heat spot.

Leaf spot was epidemic on sour and sweet cherries in the Niagara peninsula and on sour cherries in other areas. In the peninsula the disease was well controlled until after harvest. At this time with frequent rain in August and a relaxation in the spray schedule the disease spread rapidly with the result that trees were prematurely defoliated throughout the district.

The mildews of grape were present throughout the area. Downy mildew destroyed many fruit clusters of Fredonia and continued to spread in the post-bloom period with the continued wet weather and heavy vine growth. On Agawam downy mildew became serious in the late season, suddenly becoming epidemic on unprotected leaves over a wet week-end, 4-6 Aug.

Powdery mildew on grapes was prevalent in the late season and caused much shelling of fruit on some susceptible varieties (Seneca, Lincoln).

Fire blight of pears was destructive in vigorously growing Bartlett, Clapp's Favorite and Bosc varieties. Temperature and rainfall during bloom period is very important in the blossom blight phase of the disease.

May 30-31, with rain and a temperature of 65-75°F. was the one period in which conditions were favorable. At St. Catharines, this period came at the latter end of the bloom period but in the western area of the peninsula where the disease was more serious it coincided with full bloom or an earlier stage. The advance from the blossom blight to spur, terminal-twig, and branch

blight stages took place with the warm, rainy weather in early July. Exudates were heavy at this time and a heavy driving rain on 20 July washed the bacteria to new areas and spattered them on neighboring trees; it marked the period of extensive spread. Rains served to keep trees in a succulent susceptible condition and the advance of the infection in the trees was rapid and destructive. Continued wet weather in August kept the disease active much later than usual.

The wet season favored an outbreak of anthracnose on raspberry. Plantings of Taylor were seen where the cane growth was white with lesions extending to the tip leaves. Infection was common on foliage, petioles, fruit-stems and fruit. Abundant rain and the moderate temperatures prevailing in July and August along with strong heavy cane growth and a lack of protection by sprays contributed to heavy anthracnose infection (G. C. Chamberlain).

Weather conditions were very favorable for plant disease development in s.w. Que. in 1956. Over 3 in. of rain fell each month spread over 12-13 days in May, June and July. The season was also unusually late. For instance the first spray on apples applied after bud burst was not made until 15 May, fully 2 1/2 weeks later than usual. The late season adversely affected cereals and vegetable crops and the humid weather favored the development of apple scab, late blight of potatoes, pea root rot and club root of crucifers (L. Cinq-Mars).

In general, the growing season of 1956 was unfavorable for disease development in e. Quebec. The two most important factors responsible for checking the development of pathogens were temperature and humidity. Temperatures were relatively low even in July and August when the average maximum and minimum temperatures recorded were 71-73°F. and 49-52°F. respectively. Precipitation was also below the average from May to September except for June when it was about normal.

Apple scab infection was mod. in unsprayed orchards and easily checked in those under regular spray schedule. Vegetable diseases of economic importance were due to improper water relations and low temperatures. On tomatoes, losses were due to blossom-end rot and fruit cracking. In general, fruit ripening was much delayed by low temperatures. Sweet corn, in most cases, did not reach maturity before the first white frost which was recorded on 26 Sept. on low lands at Ste. Anne de la Pocatiere. Other diseases observed such as anthracnose and bacterial blight of beans, early and late blight, anthracnose, and Phoma rot of tomatoes appeared only as traces throughout Que. except in the Montreal district and Baie des Chaleurs where late blight especially was more prevalent (L. J. Coulombe).

Late blight was first observed in Que. about 25 July in the Montreal district. It was also reported at that time mostly in Irish Cobbler in Laval, Chateauguay and Napierville counties. However, weather conditions in July

were unfavorable for its spread. Temperatures also remained low throughout August, but in western Que. rainfall was very abundant and late blight could be found by mid-August in small amounts in many western counties and along the Bay of Chaleurs.

There was some spread of late blight to other parts of Quebec in the last 15 days of August and the 1st week of September and the disease was reported to be severe in w. Quebec and the Bay of Chaleurs. A light frost on 10 Sept. killed potato foliage in many districts and checked the disease. Severe frost occurred on 20 and 26 Sept. At most only traces of tuber rot were reported (H. Genereux).

In general, the winter was milder than usual at Fredericton, N.B. with much precipitation, both rain and snow, in January. However March was colder than usual and 30 in. of snow fell in the month.

Potato planting was general in the Upper Saint John River Valley in the 1st 2 weeks of May, but unfavorable weather postponed further planting until early June. Frosts in late May and the 1st week in June severely injured vegetable crops above ground and much of the vegetable seed already planted rotted during this wet cold spell. However grass and clover crops made a good start only to mature slowly during the cool wet summer.

The first ascospore discharge of the apple scab fungus occurred on 3 May. It and later spore discharges were light.

The weather from June to September was wet and cool, the temperature being 2-6° below the monthly daily mean. Strawberry, raspberry and blueberry crops were good, but cucurbit crops were failures. The harvested crop of corn and tomatoes was small. A bumper, relatively clean grain crop was harvested. The potato crop was average and it was sev. damaged by frost before all the tubers were lifted (J.L. Howatt).

The winter of 1955-56 was one of heavy and prolonged snowfall in N.S. A total fall of 162.8 in. fell at Kentville from Nov. 1955 to April 1956 inclusive, compared to a 40-year average of 86.9 inches. The mean temperature for May 1956 was nearly 4 degrees below the 40-year mean and vegetation was late. June was close to average except for a deficiency of 1.5 inches in total rainfall. July, August and September were approximately 3 degrees below the 40-year temperature mean and from July to October 7.56 in. of rain fell compared to an average of 14.08 in. for these months.

There were several infection periods for fungi such as Venturia, Botrytis, and Phytophthora but there were also many favorable periods for control operations so that the loss from disease in most crops was not serious. Early frosts in the autumn caused more damage to some crops than disease in 1956.

These weather conditions caused a loss of cucumbers for the pickling industry and a reduction in the apple crop. Apples were of small size and reduced eating quality. Many other crops were reduced in size and quality but such cool weather crops as peas were exceptionally good (J. F. Hockey).

There were no serious epidemics or unusual outbreaks of disease during 1956 in P. E. I. The weather picture for the whole year did not deviate from the 47-year average; however, there were a number of notable variations when the weather factors are considered on a monthly basis. January was unusual in all respects. The mean temperature for the month was 28.9°F. compared with 19.2°F., the 47-year average; total precipitation 8.32 in. compared to 4.20; rain, 5.27 in. compared to 1.56; sunshine 31.9 hours compared to an average 85.5. There was very little frost penetration during the winter. Farmers were able to plow in January and harvest fields of turnips which had been snowed under since early November. Potatoes were harvested in May in a sound condition after being in the ground all winter. As a result of a lack of frost many volunteer potato and turnip plants occurred in grain fields. Where potatoes were planted for the second consecutive year in the same field, mixed varieties was a problem.

Late blight was first observed in P. E. I. on 19 July, almost 2 weeks earlier than in 1955; however, the cold dry season prevented it from gaining serious headway. The total precipitation for August, September and October 1956 was 5.13 inches compared with 11.26 average. July, August and September had below average temperatures and September had considerably below average sunshine. This meant a very late grain harvest. The Septoria disease of oats was of less importance on the susceptible varieties than the previous year. October was an ideal harvest month with only 1.25 inches of rain compared to the average 4.05, and 172.5 hours sunshine compared to 132.0.

Weather conditions were favorable for apple scab and it was of considerably more importance than the previous year. An isolated case of Sclerotinia wilt in snap beans occurred early in August; cold damp weather and heavy foliage favored disease development. A combination of weather and soil factors produced the most serious molybdenum deficiency symptoms in cauliflowers seen in this province to date. Considerable club root developed in some of the June-planted turnips; a fact that could be correlated with high soil moisture in that month (J. E. Campbell).

The total precipitation in snow and rain in March and April was about normal for Nfld. Rainfall during the growing season, however, was above normal, especially in May and June (2 in.) and in September (3 in.). Temperatures during the same period were below normal and freezing temperatures were recorded at St. John's on 9 and 20 June and again by 9 Oct.

Seeding was not as late as in 1955 on the East Coast, but because of the late frost in the spring, many farmers in the Conception Bay area were forced to reseed their rapeseed and turnip fields.

Seeding was delayed considerably on the West Coast by cold wet weather and it was not completed until mid-June. A frost on 17 Sept. completely defoliated the potato crop in this area and yields were seriously reduced at the government-sponsored settlement of Cormac.

Weather conditions were again ideal on the East Coast for the spread of many diseases, particularly potato wart and late blight (G.C. Morgan).

Winter Injury on the Lower Mainland of British Columbia, 1955-56

H.N.W. Toms

Until 10 Nov., the fall of 1955 was mild with practically no frost. Rain fell almost continuously from mid-October until 7 Nov. Corn was still being canned on 5 Nov. and a large tonnage of root and green vegetables remained unharvested. The mild fall greatly delayed ripening and maturing of the crops. Then overnight on 10-11 Nov. temperatures dropped suddenly from 52°F. to as low as 7°F. for a week. Some 3500 tons of root vegetables and over 1000 tons of green vegetables still in the field or stored unprotected in barns were a total loss and damage was extensive in many other crops. December was relatively mild but some frost occurred in January, February and March. The winter therefore afforded little opportunity for injured plants to recover from the severe November freeze.

The review below is based on personal observations and on information provided by the Horticultural Branch, B.C. Dept. of Agriculture, at Abbotsford.

Small Fruits

Strawberries: 75-90% of the plantings killed, young planting stock severely injured. Losses less in weedy fields.

Raspberries: Newburgh and Lloyd George suffered sev. damage to the buds on the upper part of the canes, but in many plantings still produced a crop, somewhat reduced, in 1956. Washington was killed back to ground level and Willamette was less severely injured; both varieties produced a good crop of new canes during the summer.

Loganberries: Canes killed back to ground level and plants made only a partial recovery by new growth from the crowns.

Blackberries: Evergreen and Thornless Evergreen were sev. damaged. Himalaya, locally an escape from cultivation, was killed to the crowns, but made good cane growth in the summer. Some plantings of Thornless Upright came through fairly well and matured a crop.

Currants: Commercial plantings came through in good shape. Heavy damage to fruit buds in most home gardens and, if borer injury was also present, whole canes were killed.

Gooseberries: Almost no damage occurred.

Blueberries: Little fruit bud damage and a heavy crop of fruit in 1956. However some of the 1955 canes in plantings on peat bog land died suddenly from June onward.

Cranberries: Some foliage burning occurred but no real injury.

Tree Fruits

In general, nursery stock and young trees were very seriously damaged. Some fruit buds and occasional branches of established trees of cherry, peach, plum and apple (notably in Gravenstein) were killed. Pear and prune trees were less affected. During the summer whole trees of cherry and apples or large branches of peach and cherry trees died suddenly in home gardens in the Vancouver area.

Vegetables

The estimated losses in tons for the different vegetables were as follows: potatoes 2000, carrots 1000, turnips 300, beets 100, cabbage 800, Brussels sprouts 125, beets 100, celery 100, broccoli 75 and cauliflower 40.

Ornamentals

Rose: Almost complete loss of bushes in nurseries although there was some unexpected come-back. Heavy damage in home gardens and park plantings.

Cotoneaster, Hydrangea, Buddleia: Bushes killed to the ground in nurseries and home gardens but except for some cotoneasters sprouted again from the crowns in 1956.

Rhododendron, Azalea: Foliage badly burned and flower damage varied greatly. Some rhododendrons died suddenly in the summer.

Lilac, Forsythia, Weigela, Deutzia, Philadelphus: Sparse die-back of some flowering branches, extent depending greatly on the exposure.

Flowering Plum: Nursery stock was sev. injured but often only a few branches killed back in home gardens.

Cherry Laurel: Trees badly burned and some killed.

Border Perennials: Many plants were killed in home gardens and nurseries throughout the area.

Holly: A 50% loss of marketable branches occurred as a result of foliage discoloration and leaf-drop as well as some berry scorch. A normal crop is expected this fall.

Native Trees

Dogwood (Cornus nuttallii): Heavy loss in exposed locations. Also many trees in home gardens died during the summer after flowering normally this spring.

Maple (Acer macrophyllum): Considerable damage to branches and young trees.

Alder (Alnus rubra): Killing of young trees sev. in clearings.

Cedar, Hemlock, Pine: Considerable tip burning.

Miscellaneous

Hops: Some shoots stunted or killed in some hills in hop yards at Sardis.

Lawn Turf: Some damage and killing in patches occurred in home gardens; attributed in part to neglect in summer, to exposure and to varieties in the seed mixtures.

Pasture Grass used for Dehydration: About 1000 acres in the Sumas and Chilliwack areas were ploughed under and reseeded this year. (H. N. W. Toms).

Notes on Some Nematodes in Canada, 1956

A. D. Baker
Nematode Section, Entomology Laboratory, Ottawa

The cyst nematodes (Heterodera spp.) are practically all important crop pests. They are all capable of causing damage to some crops and they are notoriously difficult to control. The populations may often be considerably reduced by means of crop rotation to a level at which host crops can be grown successfully, but once these nematodes are well established in a field there is, at present, no known method of eradication. Probably the most publicized cyst nematode is the golden nematode, H. rostochiensis (Wollenweber, 1923) Franklin, 1940, which is known in Europe as the potato cyst nematode. This species has not yet been found in Canada. The sugar-beet nematode, H. schachtii Schmidt, 1871, and the oat cyst nematode H. avenae (Lind, Rostrup & Ravn, 1913) Filipjev, 1934, have been reported previously from Ontario in areas that do not overlap. There was no indication during 1956 of any marked spread of either of these pests. About 28 years ago another species was named and described from specimens found attacking wheat in the Prairie Provinces and since then has usually been referred to as the wheat nematode. However, this species, H. punctata Thorne, 1928, should more correctly be referred to as the grass cyst nematode. Though it has been found in Europe fairly frequently, it has always been found attacking grasses and not wheat. Surveys of wheat fields in Saskatchewan, where it was originally found, have failed to disclose it again on this crop. The only Canadian records of this species have been from the Prairie Provinces but in 1956 it was found at Cap Tourmente, Que., where roots of bentgrass, Agrostis palustris Huds., were heavily infested. It was also recorded from Lethbridge, Alta., where it was found in prairie grass sod. Records in Canada of the clover cyst nematode, H. schachtii var. trifolii Goffart, 1932, continue to accumulate, suggesting that this nematode may prove to be fairly common in this country (This form is probably a distinct species). New records for 1956 are from Ottawa, Ont., where roots of white clover, Trifolium repens L., were found heavily infested; from Durham County, Ont., on hairy vetch, Vicia villosa Roth; from Cap Tourmente, Que., on white clover, Trifolium repens L.; from Summerland, B.C., in lawn sod; from Agassiz, B.C., in oat soil; from Matsqui and Ladner, B.C., in soil; and from Victoria, B.C., on bean, Phaseolus vulgaris var. Tender Green.

The northern root-knot nematode, Meloidogyne hapla Chitwood, 1949, was found attacking carrots at Hemmingford, Que., and at Pembroke, Ont.; in a nursery at Toronto, Ont., roots of Viburnum sp. and Philadelphus coronarius L. were both heavily knotted; on alfalfa at Ottawa; and on red clover at Cap Tourmente, Que. The southern root-knot nematode, Meloidogyne incognita (Kofoid & White) Chitwood, 1949, was found at Macdonald College, Que., on red clover (in greenhouse); at Saskatoon, Sask., on roots of Coleus sp. (in greenhouse); and on roots of violet plants intercepted from Hong Kong, China. It is not yet clear whether this species can overwinter in the field in Canada.

During 1956 the potato-rot nematode, Ditylenchus destructor Thorne, 1945, was found in only one field in Prince Edward Island not previously reported, but this field was within an area where this species had been found previously.

Stunt nematodes (Tylenchorhynchus spp.) appear to be fairly common in Canada. T. magnicauda (Thorne, 1935) Filipjev, 1936, was found at Summerland, B.C., in grass sod; T. acutus Allen, 1955, at Kane, Man., on crested wheat grass; and at Wild Horse, Alta., on alfalfa; T. lenorus Brown, 1956, at Hilton, Man., in grass sod, and at Cardston, Alta., on wheat; T. leptus Allen, 1955, at Fort Macleod, Alta., in pasture sod; and T. maximus Allen, 1955, at Twin Butte, Alta., on alsike.

Up to the present the commonest root-lesion nematode in Canada appears to be Pratylenchus penetrans (Cobb, 1917) Sher & Allen, 1953. At Ottawa, Ont., it was found on raspberry and the fine roots of apple trees were heavily infested. It was also intercepted on heavily infested lily-of-the-valley pips from Germany. P. pratensis (deMan, 1880) Thorne, 1949, was found at Cap Tourmente, Que., in grass sod. P. vulnus Allen & Jensen, 1951, was found at Medicine Hat, Alta., on roses (in greenhouse); and on raspberry plants intercepted from France.

The grass seed-gall nematode, Anguina agrostis (Steinbuch, 1799) Filipjev, 1936, has been encountered rather frequently in Canada and it seems probable that at least some of these infestations have arisen through the importation of infested grass seed. New records are from Toronto Island, Ont., on Kentucky blue grass; from Colebrook, B.C., on red top grass; on bentgrass seed intercepted from Minnesota, U.S.A.; and on brown top seed intercepted from New Zealand.

New records of the ectoparasitic ring nematodes (Criconemoides spp.) include the following: C. lobatum Raski, 1952, from Ottawa, Ont., on red clover; and from Cap Tourmente, Que., on red clover. C. curvatum Raski, 1952, was found at Fort Macleod, Alta., in pasture sod and C. xenoplax Raski, 1952, at Ottawa, Ont., on white elm.

New records of ectoparasitic dagger nematodes (Xiphinema spp.) are as follows: X. americanum Cobb, 1913, at Ottawa, Ont., in large numbers on the roots of white elm; at Lethbridge, Alta., on alfalfa; at Hilton, Man., and Carmel, Sask., in grass sod; and at Summerland, B.C., in lawn sod. X. diversicaudatum (Micoletzky, 1927) Thorne, 1939, was found at St. Bruno, Que., on rose roots that were severely galled and stunted (It was reported that these plants had been imported from U.S.A. three years previously).

Radopholus gracilis (deMan, 1880) Hirschmann, 1955, was found in mud flats near Cap Tourmente, Que., infesting the roots of bulrush, Scirpus americanus Pers. Longidorus elongatus (deMan, 1876) Thorne & Swanger, 1936, was numerous in lawn sod at Ottawa, Ont. Aphelenchoides ritzema-bosi

(Schwartz, 1911) Steiner, 1932, was found infesting the foliage of Chrysanthemum sp. at Sarnia, Ont.; and a species of Trichodorus was numerous in soil around rose roots at Ottawa, Ont.

Records of predaceous nematodes belonging to the genus Mononchus include the following: M. incurvus Cobb, 1917, from St. Bruno, Que., near rose roots; M. macrostoma (Bastian, 1865) Cobb, 1916, from Blackburn Station, Ont., in a soy-bean field; M. lacustris (Cobb, M.V., 1915) Cobb, 1917, from Richmond, Ont., in soil near wild rice growing in water; M. longicaudatus (Cobb, 1893) Cobb, 1916, from Richmond, from near wild rice roots; from Picture Butte, Alta., in riverside soil; and from Summit, nr. Princeton, B.C., in streamside soil. M. parvus (deMan, 1880) Cobb, 1916, was found at Victoria, B.C., in orchard grass soil; M. papillatus (Bastian, 1865) Cobb, 1916, at Kamloops, B.C., in grass sod, and at Vernon, B.C., in soil of an apple orchard. M. muscorum (Dujardin, 1845) Cobb, 1916, was found at Richmond, Ont., near wild rice growing in water; at Ottawa, Ont., in grass sod; and at Fredericton, N.B., in grass sod. M. brachyuris (Buetschli, 1873) Cobb, 1917, was recorded from Point Pelee, Ont., in soil of an apple orchard; from Cyrville, Ont., in pasture sod; from Ottawa, Ont., in clover soil; and from Cap Tourmente, Que., in clover soil.

Records of identifications of nematodes from new hosts and new localities in Canada are published periodically from the Ottawa laboratory in The Canadian Insect Pest Review.

Phenological Data, 1956

In contrast with 1955, the dates of first anthesis for nearly all plants under observation at Ottawa were later than usual. Five years ago phenological observations were extended to several additional plants. To bring the data together and yet provide a basis for comparison, the number of years that observations have been made is shown in Table I as well as the dates of first anthesis in 1956 and the departure in days from the average date of previous years (I. J. Bassett).

From the data presented in Table 2, it appears that the season opened about 2 weeks late at Winnipeg. From mid-June until the end of July the delay in flowering amounted to only a few days. Similarly wheat was sown a week late, but the crop was harvested about the normal date.

At Saskatoon the season was about 2 weeks late in the first half of May, but then on growth was more rapid and plants came into flower at about the normal date during mid-season and several days before the usual date during the latter part of the season. Wheat was sown 10 days late and was harvested only 4 days late.

Around Edmonton the season was somewhat late at the beginning of the season but from mid-season on most of the native plants bloomed before the normal date. However, wheat sown 6 days late was harvested 8 days later than usual (R.J. Russell).

If the data given in these reports are analyzed it is evident that after 1947 the date of seeding for wheat at Saskatoon has been noticeably later than it was up to that year. From 1936 to 1947 (omitting 1944) the seeding date ranged from April 10 (1946) to 4 May (1942) and averaged 23 April. From 1948 to 1956 it ranged from 30 April (1949) to 13 May (1955) and averaged 8 May. Thus seeding has been on the average 15 days later in the last 9 years than formerly. This delay has been occasioned in part by the lateness of the season between 1948 and 1956 when anthesis of the flowers of Populus tremuloides was delayed 10 days and that of Acer negundo by 4 days.

According to Mr. H. Gerrie, Field Husbandry Department of the University of Saskatchewan, experiments conducted at Saskatoon 1929-1949 have shown that the yield of wheat from plots sown on 1 May exceeded that from plots sown on 15 May in 10 out of the 21 years, was less in 10 other years and in 1947 the yield at both dates was the same. From these data Dr. Russell concludes that the average optimum date for seeding is about 8 May (I. L. Conners).

Table I. Phenological Data at Ottawa, Ont. in 1956

Species	Years Observed	Date of First Anthesis	Departure from Average in Days
Alnus rugosa	5	6/4	1L
Acer saccharinum	21	11/4	1L
Corylus cornuta	4	23/4	9L
Populus tremuloides	16	27/4	11L
Poa annua	5	1/5	5L
Populus grandidentata	5	5/5	12L
Ulmus americana	21	6/5	12L
Acer rubrum	5	8/5	12L
Acer negundo	16	12/5	7L
Betula papyrifera	5	14/5	12L
Acer saccharum	19	21/5	13L
Prunus pensylvanica	15	28/5	15L
Fagus grandifolia	4	28/5	12L
Alopecurus pratensis	5	28/5	15L
Fraxinus americana	4	29/5	15L
Smilacina stellata	15	31/5	12L
Quercus macrocarpa	5	4/6	13L
Pinus sylvestris	21	5/6	9L
Poa pratensis	5	12/6	15L
Rumex acetosella	5	12/6	10L
Anemone canadensis	15	12/6	10L
Juglans nigra	5	14/6	8L
Dactylis glomerata	5	17/6	7L
Carya cordiformis	12	23/6	11L
Bromus inermis	15	23/6	5L
Phleum pratense	15	30/6	6L
Agropyron repens	3	1/7	6L
Rhus typhina	10	9/7	15L
Tilia americana	15	10/7	5L
Catalpa ovata	13	17/7	17L
Ambrosia trifida	5	20/7	9L
Cephalanthus occidentalis	11	30/7	13L
Ambrosia artemisiifolia	4	6/8	2E
Artemesia vulgaris	3	6/8	12L
Hamamelis virginiana	13	9/9	11E

(I. J. Bassett)

Table 2. Summary of Phenological Data Taken at Winnipeg, Saskatoon, and Edmonton in 1956

Species	Winnipeg		Saskatoon		Edmonton	
Corylus rostrata	--	--	--	--	10/5	6L
Shepherdia canadensis	--	--	--	--	10/5	N
Pulsatilla ludoviciana	--	--	24/4	5L	--	--
Populus tremuloides	6/5	10L	9/5	14L	2/5	6L
Phlox hoodii	--	--	12/5	13L	--	--
Salix petiolaris	--	--	16/5	9L	4/5	3E
Acer negundo	21/5	14L	16/5	8L	15/5	12L
Betula papyrifera	--	--	17/5	6L	13/5	5L
Thermopsis rhombifolia	--	--	15/5	4L	--	--
Prunus americana	29/5	15L	--	--	--	--
Amelanchier alnifolia	31/5	13L	22/5	7L	22/5	5L
Hierochloe odorata	--	--	25/5	5L	--	--
Prunus pensylvanica	--	--	25/5	5L	20/5	1L
Viola rugulosa	--	--	28/5	6L	22/5	N
Smilacina stellata	--	--	22/5	3E	28/5	1L
Viburnum lentago	10/6	7L	--	--	--	--
Prunus melanocarpa	6/6	12L	29/5	1L	30/5	1L
Crataegus chrysocarpa	4/6	12L	31/5	3L	28/5	3E
Cornus stolonifera	--	--	1/6	2L	3/6	N
Thalictrum turneri	--	--	--	--	4/6	2E
Elaeagnus commutata	--	--	6/6	1L	2/6	3E
Lonicera glaucescens	--	--	8/6	N	26/5	13E
Hedysarum americanum	--	--	14/6	5L	--	--
Achillea lanulosa	--	--	8/6	2E	--	--
Anemone canadensis	--	--	14/6	3L	13/6	11E
Viburnum pubescens	14/6	4L	--	--	--	--
Galium boreale	--	--	16/6	1L	13/6	11E
Maianthemum canadense	--	--	--	--	28/5	7E
Rosa alcea	--	--	18/6	2E	4/6	9E
Bromus inermis	23/6	2L	19/6	5E	18/6	10E
Campanula petiolata	--	--	24/6	1L	2/7	8E
Gaillardia aristata	--	--	2/7	7L	--	--
Spirea alba	--	--	24/6	7E	18/6	15E
Chrysopsis hirsutissima	--	--	8/7	5L	--	--
Symphoricarpos occidentalis	1/7	4L	27/6	6E	10/7	6L
Chamaenerion spicatum	--	--	24/6	9E	3/7	5E
Psoralidium argophyllum	--	--	8/7	3E	--	--
Phleum pratense	--	--	--	--	6/7	1E
Apocynum androsaemifolium	--	--	--	--	5/7	8E
Solidago missouriensis	--	--	9/7	7E	--	--

Species	Winnipeg		Saskatoon		Edmonton	
Solidago canadensis	28/7	6L	--	--	23/7	2L
Grindelia perennis	--	--	15/7	8E	--	--
Oligoneuron canescens	--	--	22/7	4E	--	--
Aster conspicuus	--	--	--	--	23/7	1E
Aster laevis	--	--	24/7	6E	21/7	9E
Wheat -						
Seeding	4/5	7L	10/5	10L	7/5	6L
Emergence	18/5	9L	24/5	12L	15/5	4L
Heading	27/6	4E	8/7	6L	--	--
Maturity	7/8	N	14/8	4L	27/8	8L

I. DISEASES OF CEREAL CROPS

WHEAT

EYE SPOT (Cerosporella herpotrichoides). Occasional extensive patches of lodging which in a few instances were of serious concern to the grower occurred near Alliston, Ont. (R. J. Baylis).

MOLD (Cladosporium sp.). A sample of Selkirk wheat straw from Sask. exhibited a superficial saprophytic mold in the stem cavity (P. M. Simmonds, D. B. O. Savile).

ERGOT (Claviceps purpurea) See Ergot Survey.

POWDERY MILDEW (Erysiphe graminis). In 182 fields examined in s. Alta. there were 2-tr. 9-sl. 2-mod. infections (J. S. Horricks) in addition to one report from Stoney Plain, Alta. (A. W. Henry). A mod. infection caused sl. damage in varietal test plots at Ste. Anne de la Pocatiere, Que. (R. O. Lachance).

HEAD BLIGHT (Fusarium spp.). Fusarium poae was isolated from heads of wheat from a field showing tr. infection at Macdonald, Man. (W. L. Gordon). Up to 5% of heads in 3 fields near Chatham, Ont. were affected; av. infection for Kent Co., Ont. was somewhat less than 1%. Fusarium sp. was found on dead leaves of sev. damaged winter wheat at Stayner, Ont. (S. J. Fushtey).

SPOT BLOTCH (Helminthosporium sorokinianum). Sl. infection occurred in 1/182 fields in Alta. (J. S. H.).

COMMON ROOT ROT (H. sorokinianum and Fusarium spp.) was found in 167/182 fields in s. Alta; infection was 117-tr. 46-sl. 4-mod. (J. S. H.). It was general in central and n. Alta. with infections of 106-tr. 96-sl. 9-mod. in 256 fields examined (W. P. Campbell). For Sask. crop districts 1 to 9, the disease ratings and Sept. yield estimates (in brackets) were 8.5 (23.7) 9.4 (22.5) 9.4 (22.2) 10.0 (21.7) 7.5 (26.1) 10.6 (22.5) 8.1 (23.7) 7.7 (24.4) and 9.7 (22.1 bu. / ac. Growing conditions favored large yields of grain in 1956 and near av. levels of root rot infection. The net loss from root rot is considered to be very low because growing conditions favored recovery from the initial stunting effects of the disease. The av. disease rating from 167 fields was 9.1 (B. J. Sallans). Also reported from Palmer, Sask. on seedlings (T. C. Vanterpool). Root rot caused shrunken heads of Lee in one area of a field at Sperling, Man. (J. E. Machacek). H. sorokinianum and F. equiseti were isolated from the basal parts of occasional plants that showed white heads in a field at Portage la Prairie, Man. (W. L. Gordon).

TAKE-ALL (Ophiobolus graminis). In s. Alta. examination revealed 4-sl. 2 mod. infections /182 fields (J.S.H.). In n. and central Alta. infections were 34-tr. 15-sl. 8-mod. 7-sev./256 fields. It was very serious in some fields in the Fort Vermilion area and the black soil zone (W.P.C.). It occurred in patches in a field at Spruce Valley, was quite prevalent in 4-H club plots at Deadwood and Berwyn, and was noted from Spruce Grove (A. W. Henry). Ratings for Sask. were 8-tr. 4-sl. 4-mod. 1-sev./167 fields. It occurred in all crop districts but most frequently in districts 5, 7 and 8 (B. J. Sallans). Take-all together with hessian fly and some eye spot caused lodging of extensive patches in fields of winter wheat nr. Alliston, Ont. (R. J. Baylis).

STEM RUST (Puccinia graminis). A tr. infection was reported on Ridit wheat from University plots at Vancouver, B.C. (H.N.W. Toms). Three fields of Lemhi wheat grown on irrigated land were sev. diseased. Ratings for the remaining 44/192 fields surveyed in s. Alta. were 35-tr. 6-sl. 3-mod. (J.S.H.). In central and n. Alta. infections were 19-tr. 19-sl. 5-mod. 6-sev./256 fields. The disease was centered in the Drumheller-Stettler area. It occurred predominantly on the variety Red Bobs and caused mod.-sev. damage; some late fields were not worth harvesting (W.P.C.). Av. damage was sl. in Sask. with ratings of: 73-tr. 32-sl. 11-mod. 1-sev. for 117/214 fields. The first collection was made 12 July on durum wheat. It was found as far w. as Sceptre and n.w. as far as Meota (H.W. Mead). Sev. in one field at Notre Dame du Lac, Que. and mod. in variety test plots in Que. (D. Leblond). A field of Marquis wheat showed mod.-sev. infection and a plot of Huron wheat showed tr. at Riviere Ouelle (R.O. Lachance). See Cereal Rusts in Canada in 1956.

LEAF RUST (Puccinia triticina). Infections in 182 fields examined in s. Alta. were 35-tr. 19-sl. 7-mod. 1-sev. (J.S.H.). In central Alta. ratings were 20-tr. 38-sl. 32-mod. 21-sev./256 fields. The mod. and sev. infections would reduce both yield and quality (W.P.C.). 123/214 fields in Sask. were diseased with the following ratings: 48-tr. 54-sl. 11-mod. 10-sev. and on the av. caused sl. damage. First collection was at Landis on 19 July. The distribution was much the same as for stem rust (H.W.M.). In a survey of 52 fields in Simcoe Co. Ont. most fields were mod. to sev. rusted (R.J. Baylis). Tr. infection was found on Huron and Acadia and sl. infection on Cascade Couley at Ste. Anne de la Pocatiere, Que. (R.O. Lachance). Redman and Marquis wheat in plots had 1% infection that caused sl. damage at Normandin (H. Genereux). It was reported sev. in all variety test plots in Que. (D. Leblond).

BROWNING ROOT ROT (Pythium spp.). Brown areas in wheat fields around Saskatoon, Sask. resembled those affected by browning root rot but the injury was attributed to dry weather in May and a decrease in the use of phosphate fertilizer. Samples exhibited little or no root lesioning or contained few oospores (T.C. Vanterpool).

SEEDLING BLIGHT (Rhizoctonia solani and Pythium arrhenomanes). In Sask. heavy damage was caused in greenhouse experiments to wheat grown in pots. The isolate of R. solani is the most virulent that I have attacking wheat (T. C. Vanterpool).

GLUME BLOTCH (Septoria nodorum). In s. Alta. ratings were 2-tr. 1-sl./182 fields (J. S. H.). In central and n. Alta. 64/256 fields were rated 41-tr. 19-sl. 4-mod. (W. P. C.). Sl. damage was caused by infections in 29/214 fields examined and rated as follows: 5-tr. 22-sl. 2-mod. (H. W. M.). On 10 July about 25% of the lower leaf area of Lee wheat at La Salle, Man. was lesioned. Pycnidia were abundant in the older lesions and spores of the S. nodorum type were present in leaf washings (W. A. F. Hagborg). Glume blotch was common on winter wheat in several fields at Guelph, Ont. Infection was sl. to mod. (S. J. Fushtey).

SPECKLED LEAF BLOTCH (Septoria spp.) Infection was 36-tr. 128-sl. 38-mod. 4-sev. in 206/256 fields in central and n. Alta. (W. P. C.). In s. Alta. ratings were 57-tr. 89-sl. 11-mod. 1-sev./182 fields. Several durum and winter wheat varieties were sev. diseased in Lethbridge plots (J. S. H.). Mod. to sev. leaf spot was found on young plants in 1 field in the spring and sl. to mod. infections were found in several fields near Guelph, Ont. (S. J. Fushtey). Tr. infection was found on several varieties at Ste. Anne de la Pocatiere, Que. (R. O. Lachance). Infection caused by Septoria spp. on leaves and sheaths of wheat was generally present throughout Man. A study of samples sent in from Sask. and Alta. indicated that these diseases were widespread in these provinces also. Infection was generally light and yield losses resulting from leaf destruction were probably insignificant. Three species of Septoria were present: S. avenae f. sp. triticea and S. nodorum, which were separated on spore size and shape and by pathogenicity tests on Little Club wheat, and S. tritici. In the samples examined the frequency of occurrence of the species in the order given was 38, 19, 5 for Man., 1, 3 and 0 for Sask. and 3, 2 and 1 for Alta. The finding of S. tritici in 5 wheat samples from Man. was unexpected because this species has in past years been found almost exclusively in areas where winter wheat is grown (T. Johnson).

COMMON BUNT (Tilletia caries and T. foetida). Results of the wheat bunt survey (Table 3), based on cars of wheat graded smutty in Western Canada, indicate a low incidence of the disease in Hard Red Spring and Amber Durum grades. Bunt has declined progressively in Alta. Red Winter Wheat over the last three years. Bunt was not found in the 90 fields examined in Man. (W. Popp). One field of Red Bobs was sev. infected by T. foetida at Whiskey Gap, Alta./182 examined (J. S. H.). A tr. occurred in 1/214 fields examined in Sask. (R. C. Russell). Found in only 2 fields of 600 acres surveyed in the Ottawa Valley, Ont. One field of Dawson's Golden Chaff grown from untreated seed had 5% of the heads bunted. Common bunt was detected in tr. amounts in 3/52 fields examined in Simcoe Co. (R. J. Baylis). Two fields had 0.1% infection and 1 had 2% infection near Barrie, Ont. (S. J. Fushtey).

Table 3. Common Bunt in Wheat in Western Canada

Class of Wheat	Aug. 1, 1955 to July 31, 1956			Aug. 1, 1956 to Oct. 31, 1956		
	Cars Inspected	Cars Graded Smutty	% Graded Smutty	Cars Inspected	Cars Graded Smutty	% Graded Smutty
Hard Red Spring	180,007	186	0.10	51,140	51	0.10
Amber Durum	8,116	2	0.02	2,829	1	0.04
White Spring	95	0	0.00	53	0	0.00
Alta. Red Winter	1,144	11	0.96	775	4	0.52
Garnet	1,073	0	0.00	135	0	0.00
Mixed Wheat	102	0	0.00	22	1	4.54
All classes	190,537	199	0.10	54,954	57	0.10

DWARF BUNT (Tilletia contraversa). Tr. amounts of what appeared to be dwarf bunt in 2 fields of Karkov wheat; one nr. Lethbridge and the other nr. Cardston, Alta. However, when spores of these samples were germinated they behaved like those of common bunt (M. W. Cormack, R. J. Baylis). One field near Stayner, Ont. had 0.5% infection (S. J. Fushtey). Tr. infections were found in 20% of 52 fields totaling 1500 acres inspected in Simcoe Co. The most sev. infection was 1%, observed nr. Stayner within 1 mi. of the extremely heavy infection reported last year. No dwarf bunt was found in 600 acres surveyed in the Ottawa Valley (R. J. Baylis). Six/12 Ontario samples were found to contain spores of T. contraversa. The samples were from Ailsa Craig, Middlesex Co., Zurich, Huron Co.; Kincardine, Bruce Co.; Tilbury and Chatham, Kent Co.; and Alma, Wellington Co. (R. E. Wight).

LOOSE SMUT (Ustilago tritici). Tr. infection was found in 5/182 fields examined in s. Alta. (J. S. H.). One field had a 1-2% infection and 8 fields carried a tr. in 214 examined in Sask. (R. C. Russell). In Man. 22/90 fields were affected. The amount of smut ranged from 0-10% and compared with the 1955 av. of 1.2%, there was a sl. decrease in the amount of loose smut, apparently as a result of fewer fields of Lee wheat, a very susceptible variety (W. Popp). Loose smut was found in 17/52 fields examined in Simcoe Co., Ont., and in tr. amounts not exceeding 1%, in all fields examined (600 acres) in the Ottawa Valley (R. J. Baylis) One field of Huron wheat had 3% infection at Ste. Anne de la Pocatiere, Que. (R. O. Lachance).

BLACK POINT (various fungi). Only 2 lots of durum wheat from Foremost, Alta. were affected (J. S. H.).

BASAL GLUME ROT (Pseudomonas atrofaciens). Tr. infection was found in 1 field in central Alta./256 examined (W. P. C.). Tr. infections were found in 1 field at Shipman (n. -central Sask.) and in 1 field at Yorkton (e. -central Sask.)/22 examined (H. W. Mead).

BLACK CHAFF. A bacterial striping of the culm that resembles black chaff occurred at Spruce Grove and Edmonton, Alta. (A. W. Henry).

STREAK MOSAIC (virus) caused sl. infection in winter wheat plots at Lethbridge, Alta. Most stands of winter wheat that might have harbored the mite vector and virus suffered sev. winter injury (J. S. H.)

HEAD DISCOLORATION (physiological). This abnormality was found in 3 fields of Rescue wheat: 1-tr. 1-sl. 1-mod./182 fields examined in Alta. (J. S. H.). Several bronzed heads of Chinook wheat were sent in from Kindersly, Elbon, and Richlea, Sask. during Sept. (T. C. Vanterpool).

HEAT CANKER and CHLOROTIC BANDING (high temperature). Reported from Lumsden, Browning, Prince Albert, Rosthern and N. Battleford, Sask. Recovery was usually high. If the high temperature coincides with the day of emergence of deep-seeded grain there may be considerable damage. Over half the plants in one field of deep-sown Rescue were killed by high temperature (T. C. V.). About 40% of the primary leaves of a field at Culross, Man. were either cut off by necrosis or bore a chlorotic band across the leaf. Evidently the damage had occurred at the soil line during the high temperatures of 9-11 June (W. A. F. Hagborg).

MELANISM (physiological) of the peduncles occurred almost entirely in lodged portions of 2 heavily fertilized fields of Selkirk wheat; 1 at Rosser and 1 at Winnipeg, Man. Isolations yielded a mixed flora of saprophytic fungi and bacteria. Yield reduction was small and insignificant based on the weight of grain from 100 heads (W. A. F. Hagborg). A specimen sent in from Brandon, Man. yielded H. sorokinianum from discolored nodes (W. L. Gordon).

FROST INJURY Samples showing longitudinal cracking of the kernel cheek were collected Aug. 19, Sept. 5-7 (T. C. Vanterpool).

LEAF SPOT (cause unknown). Leaf spot was found in 18/182 fields at the following rates: 5-tr. 6-sl. 7-mod. (J. S. H.).

OATS

ERGOT (Claviceps purpurea) was reported on New Garry oats from Durham Co. Ont. (S. J. Fushtey). See also Ergot Survey.

POWDERY MILDEW (Erysiphe graminis). A tr. infection causing negligible damage was reported in 3/3 fields near Berwick, Kings Co., N.S. (D. W. Creelman).

COMMON ROOT ROT (Fusarium spp.). Infection was 5-tr. 2-sl. in 7/212 fields in n. Alta. (W. P. C.). In s. Alta. ratings were 3 tr-/23 fields (J. S. H.) Root rot caused by F. culmorum was found in a low area along the margin of a field at Fortier, Man. F. equiseti was also isolated (W. L. Gordon).

LEAF BLOTCH (Helminthosporium avenae). In the 23 fields examined infection was 5-tr. 6-sl. in s. Alta. (J. S. H.). It was also prevalent in 1 field at Royal Park, Alta. (A. W. Henry). Mod. infection was observed in fields which would be harvested late at Riviere Ouelle, Que. (R. O. Lachance). The disease was prevalent in the E. Townships and sl. in variety test plots in Que. (D. Leblond).

CROWN RUST (Puccinia coronata). A tr. infection in 4 fields in e. central Saskatchewan out of 22 fields examined (H. W. M.). Present in tr. amounts in Quebec test plots; most prevalent at Ste. Victoire and Ste. Anne de la Pocatiere. Abegweit was the most susceptible variety (D. Leblond). Slight damage was caused by tr. infections in Annapolis, Kings and Lunenburg Counties, N.S. (D. W. Creelman). Tr. to sev. infection caused sl.-sev. damage in 10 fields examined in Queens and Kings Counties, P. E. I. (R. R. Hurst).

STEM RUST (Puccinia graminis). Infections were 18-tr. 6-sl. in central Alta. /212 fields examined in n. and central Alta. (W. P. C.) In s. Alta. 1-tr. /23 fields examined (J. S. H.). In Sask. infections were 8-tr. 6-sl. 1-sev. in 15/22 fields and caused sl. damage (H. W. M.). On the average, present in Que. in tr. amounts in test plots. Sev. infection noted at St. Simion and mod.-sev. at Ste. Victoire, mod. at Maskinonge and Notre Dame du Bon Conseil. Shefford was the most susceptible variety (D. Leblond). One field had 10% infection which caused sl. damage at Bridgetown, N.S. (D. W. Creelman). Sl. infection was general in P. E. I. except on late-sown oats which were mod.-sev. infected (R. R. Hurst).

SPECKLED LEAF BLOTCH (Septoria avenae). Infection was 6-tr. 8-sl. in 14/212 fields in Alta. (W. P. C.). Slight damage was caused in 5/30 fields in Sask. (H. W. M.). Several varieties in Ste. Anne de la Pocatiere, Que. carried sl.-mod. infection; the disease was general throughout e. Que. (R. O. Lachance).

Generally mod. infection in test plots. Abegweit and New Garry had less infection but the difference in susceptibility between varieties was slight. Infection was lower in the E. Townships (sl.) and higher in the Gaspe (sev. at St. Charles de Caplan) (D. Leblond). Infection was general and ranged from 20 to 75% in individual fields in Kings Co., N.S. Helminthosporium avenae was not specifically noted but conceivably was present too (D. W. Creelman). Speckled leaf blotch was particularly prevalent about Ottawa, Ont., and Fredericton, N.B., and caused a great deal of damage to the oat crop. The disease was less sev. at Guelph, Ont., Caplan, Que., and Nappan, N.S., and least sev. at Harrow, Ont., Ste. Anne de Bellevue and Ste. Anne de la Pocatiere, Que., and Charlottetown, P.E.I. (R.V. Clark).

LOOSE SMUT (Ustilago avenae). One field sl. infected out of 23 examined in s. Alta. (J.S.H.). Quite rare in Sask.; only 1/30 fields infected and this caused negligible damage (R.C. Russell). 4/94 fields had tr. amounts in Man. (W. Popp). Affected 4-5% of plants in 1/2 acre field in Que. (L. Cinq-Mars). One field in Kings Co., N.S. had 5% infection (D.W. Creelman). Tr. amounts present in 10 fields in Prince and Queens Counties, P.E.I. (R.R. Hurst).

COVERED SMUT (Ustilago kolleri). Infections in Alta. ranged from tr. to 24% in 28/212 fields; av. infection, 0.7% (W.P.C.). In Sask. infection ranged from tr. to 4% in 10/30 fields and caused 1% damage in the affected fields (R.C. Russell). 14/94 fields examined in Man. had up to 5% smutted heads, av. 0.2% (W. Popp). Only Shefford oats were smutted in the test plots along the Lower St. Lawrence and in the Gaspé, Que. (D. Leblond).

HALO BLIGHT (Pseudomonas coronafaciens). In n. and central Alta. the infections were 85-tr. 79-sl. 16-mod. 2-sev. for 182/212 fields (W.P.C.). Ratings of 2-tr. 2-sl. for 4/23 s. Alta. fields were also reported (J.S.H.). Infection was tr. on 10% of primary leaves in 1/10 fields examined in Man. The low-disease rating probably was related to the high temperature in June (W.A.F. Hagborg).

BLAST (non-parasitic) occurred in 164/212 fields at the following rates: 69-tr. 71-sl. 20-mod. 4-sev. in n. and central Alta. (W.P.C.) and at 3-tr. 16-sl. 3-mod. in 22/23 fields in s. Alta. (J.S.H.). A sample of Rodney oats from Turtleford, Sask. showed blast (T.C. Vanterpool). A survey of 22 fields gave readings of 40-sl. 2-mod. 1-sev., resulting in sl. damage in Sask. (H.W.M.). Sl. to mod. in the test plots in Que.; mod. at Lake St. John and Lower St. Lawrence, mod.-sev. in the Gaspé. Abegweit and MC5740 were most affected (D. Leblond).

CHLOROTIC BANDING (associated with extreme heat). Reported in several fields of oats in Alta. following a period of extreme heat early in the season (J.S.H.). Reported from Nipawin, (w. Sask.) where it resulted in a reduced stand (T.C. Vanterpool).

BIRD INJURY caused by blackbirds was reported from Carrot River and Moosonin, Sask. (T.C.V.).

RED LEAF (?virus). A slight infection in most fields examined in Kamarouska Co., Que., but the cause of disease was not determined (R.O. Lachance).

BARLEY

ERGOT (Claviceps purpurea). See Ergot Survey.

POWDERY MILDEW (Erysiphe graminis). Infections were 2-tr., 2-sl., 1-mod./42 fields surveyed in Alta. (J.S.H.). Sl. infection was noted on lower leaves in 1 field at Poplar Point, Man. (W.L. Gordon). Also on 6-rowed barley at Morden, Man. and 2-rowed varieties at Winnipeg (H.A.H. Wallace). Mod. in winter barley plots at Ont. Agr. Coll., Guelph (S.J. Fushtey). Present in tr. amounts in variety test plots in Que. Sl. to mod. at St. Hyacinthe and Ste. Anne de Bellevue (D. Leblond).

HEAD BLIGHT (Fusarium spp.). F. poae was isolated from occasional infected spikelets from a sl. infected planting of Vantmore barley at Ericksdale, Man. (W.L. Gordon). From a sl. general infection in a field at Farmystele the isolations were H. sorokinianum (chiefly), Fusarium acuminatum and F. poae (W.L. Gordon). Average infection was sl. in variety test plots in Que. Brant and M.C. 6940 were most affected. The disease was most severe at Grandes Bergeronnes in the Lake St. John region (D. Leblond).

STRIPE (Helminthosporium gramineum). Recorded only as 2-tr. 1-sl./42 fields in Alta. (J.S.H.).

SPOT BLOTCH (Helminthosporium sorokinianum). Alta. survey reports 1-tr. 7-sl./42 fields (J.S.H.). One sl. infection in a field at Langhum, Sask. out of 22 examined (H.W.M.). H. sorokinianum caused a very poor barley crop at the Charlottetown Exp. Farm, P.E.I. (R.V. Clark).

COMMON ROOT ROT (H. sorokinianum and Fusarium spp.). Infection was general throughout Alta. 76-tr. 130-sl. 31-mod. 2-sev./289 fields examined (W.P.C.). J.S. Horricks reports 12-tr. 20-sl. 5-mod./42 fields in s. Alta. An av. disease rating of 11.2 was obtained from an examination of 19 fields in Sask. All 19 fields had some root rot present (B.J. Sallans). Seedling blight was mod. in 1 field at Horndean, Man., chiefly H. sorokinianum but Fusarium poae also was isolated (H.A.H. Wallace, W.L. Gordon).

NET BLOTCH (Helminthosporium teres). Infection was 57-tr. 97-sl. 58-mod. 44-sev. in 256/289 fields in Alta. (W. P. C.). Heavy infections occurred at Radway and Spruce Grove (A. W. Henry). Net blotch was about half as common as scald in central and n. Alta. Late-sown barley was most sev. affected. Scald had defoliated many barley fields earlier in the summer and may have reduced the prevalence of net blotch (W. P. Skoropad). It also occurred as 5-tr. 14-sl. 9-mod. 1-sev. in 29/42 fields in s. Alta. (J. S. H.). An increase in this disease has been noted for the last few years in Sask. Ratings were 1-sl. 9-mod. 6-sev. for 16/22 fields. It occurred in all barley-growing areas (H. W. M.). Also reported from Prince Albert, Watson and Stony Beach, Sask. (T. C. Vanterpool). Net blotch was present in tr. amounts in 6/6 fields in Man. (W. A. F. Hagborg). Sl-mod. infection was found on winter barley in Ont. Agr. Coll. plots. Mod.-sev. infection occurred in a field of volunteer barley at Guelph, Ont. (S. J. Fushtey). Sl. in variety test plots in Que. except at St. Pierre where it was prominent (D. Leblond).

TAKE-ALL (Ophiobolus graminis). Only 1 field with sl. infection n. of Ft. St. Jean, out of 19 fields examined in B. C., 270 fields in central and n. Alta. were all unaffected by take-all (W. P. C.).

STEM RUST (Puccinia graminis). Infection was 5-tr. 4-sl. for 9/42 fields in s. Alta. (J. S. H.); and 1-tr. 1-sl. n. of Drumheller for 2/289 fields in central Alta. (W. P. C.). Tr. infection occurred at North Battleford, (n. w. Sask.) and LaFleche, (s. e. Sask.); 22 fields were examined in Sask. (H. W. M.). In Que. tr. infections occurred in most variety test plots. M. C. 7940 was most susceptible, especially at St. Jacques, Que. (D. Leblond).

LEAF RUST (Puccinia hordei). A small plot of Olli barley was 1% infected and slightly damaged at Normandin, Que. (H. Genereux). Variety test plots in Que. averaged tr. infection. Montcalm and Parkland were most affected. The disease was most prominent about Ste. Anne de la Pocatiere (D. Leblond).

BROWNING ROOT ROT (Pythium spp.). A crop of Vantage barley near Ryley, Alta., was affected (A. W. Henry).

SCALD (Rhynchosporium secalis). In s. Alta. it was reported 5-tr. 11-sl. 1-mod. 1-sev. in 18/42 fields (J. S. H.), whereas in central and n. Alta. 181/289 fields were diseased. Barley scald was unquestionably the most serious foliage disease in 1956 in central and n. Alta. It appeared when most of the barley was in the three-leaf stage and spread rapidly under favourable weather conditions. Cool night temperatures with heavy dew persisting till late morning were common during the summer. Barley in the Lacombe-Edmonton area was affected most severely, in some cases to the extent that malting varieties were reduced to feed grades. Very few barley fields were

free of the disease in this area. In the Peace River and Ft. Vermilion regions, where barley is becoming rapidly the major cereal crop, the occurrence of scald was somewhat patchy. Some fields were free of the disease while others were affected in tr. to sev. amounts. Scald was found in about 60% of the fields inspected. The above indicates how closely this disease follows intensive barley cropping (W. P. Skoropad). Most severe infections centered in the black soil zones, becoming more prevalent in the Peace River area as barley becomes a more important crop (W. P. C.). Of 22 fields examined in Sask. 2 at Swift Current had mod. infection and 1 at Melfort had tr. (H. W. M.).

SPECKLED LEAF BLOTCH (Septoria passerini). A tr. was reported in 3/42 fields in s. Alta. (J. S. H.). In central and n. Alta. 6-tr. 46-sl. 25-mod. 10-sev. infections were recorded for 87/289 fields (W. P. C.). Speckled leaf blotch was present mainly on the mature crop and in general it appeared to have caused little damage. It was considerably less prevalent in the more northerly barley regions of Alta. (W. P. Skoropad). In Sask. the damage was mod. with the following infection ratings: 3-sl. 5-mod. 1-sev. for 9/22 fields (H. W. M.). Also reported as 1-tr. at Watson and 1-sev. at Rowletta, Sask. (T. C. Vanterpool). In Man., speckled leaf blotch was widespread but probably caused little damage. Infections were abundant in s. Man. early in the season. The epidemic did not develop rapidly and at harvest infection was light compared with 1955. (P. D. S. 35:13). The ratings were 3-tr. 4-sl. 7-mod. 1-sev./15 fields (G. J. Green). Slight in variety test plots in Que.; most prominent at St. Pierre (D. Leblond).

COVERED SMUT (Ustilago hordei) occurred in 22/289 fields in central and n. Alta.; infections ranged from tr. to 15% and averaged nearly 0.2% (W. P. C.); and 2-tr./42 fields in s. Alta. (J. S. H.). In Sask. 4/22 fields averaged 0.3% infection and none exceeded 2% (R. C. Russell). 52/138 fields surveyed in Man. had a maximum infection ot 15%, and av. infection of 0.7%. This was a marked increase and was noticed especially in the n. part of Man. (W. Popp). In Que. 15/15 fields had covered smut. Maximum infection of 15% occurred in 2 fields (R. O. Lachance).

LOOSE SMUT (Ustilago nuda). Vantage barley in University plots showed tr. infection at Vancouver, B. C. (H. N. W. Toms). Loose smut was recorded in 120/289 fields in central and n. Alta.; infection ranged from tr. to 20, and averaged almost 1% (W. P. C.). In s. Alta. 5/42 fields were rated tr. (J. S. H.). In Sask. average infection was 0.7% and ranged from tr. to 5% in 13/22 fields examined (R. C. Russell). 106/138 fields surveyed in Man. had true loose smut (U. nuda). The mean infection was 1.0% and the maximum was 15% and represents a slight increase from 1955 (W. Popp). False loose smut (U. nigra) was present in 8/138 Man. fields at 0-4%, av. 0.1% (W. Popp). In a 17-acre field of Fort barley at the Experimental Farm, Normandin, Que., 8% infection of loose smut was observed; another small field showed a 5% infection (H. Genereux).

Fort barley that had not been given hot-water treatment showed 3% infection at Ste. Anne de la Pocatiere (R.O. Lachance). In the variety test plots in Lake St. John region all varieties were sl. affected except Parkland which was unaffected (D. Leblond).

BACTERIAL STREAK (Xanthomonas translucens). Reported as 2-tr./42 fields in s. Alta. (J.S.H.). It was found in 75% of fields examined before the end of the growing season and was fairly uniformly distributed through central and n. Alta. The incidence of the disease was considerably higher than in the previous few years (W.P. Skoropad). Infection was 3-tr. 4-sl. 3-mod. in 10/12 fields examined in Man. (W.A.F. Hagborg).

FALSE STRIPE (virus). Traces only were reported in 2 fields, at New Norway and Worsley, in a survey of 289 fields in Alta. (W.P.C.). (W.P. Skoropad observes that false stripe of barley, although not yet very common in Alta. appears to have increased in comparatively alarming proportions in the last few years. It has been found right across Alta. and perhaps most commonly at experimental institutions (cf. H.A.H. Wallace, P.D.S. 35:15, 1955). Symptoms usually appear late and the plants are not stunted severely.). In s. Alta. ratings were 1-sl. 1-mod./42 fields (J.S.H.). One sl. infection was noted at Weyburn, Sask. in a survey of 22 fields (H.W.M.). In Man. a tr. was found at Domain and the disease was transmitted to barley seedlings in the greenhouse. A field of Garton's barley at Fortier had 16% infected culms based on five 50-culm random samples (W.A.F. Hagborg).

A special report of a barley leaf disease survey in the Prairie Provinces was prepared by H.A.H. Wallace and is summarized below. It is based on observations made in 90 fields in Man., 158 fields in Sask. and 63 fields in Alta. and at Prairie experimental farms from July 25 to Aug. 10. Leaf spots caused by Helminthosporium spp. (mostly H. teres and some H. sorokinianum) were present in nearly all fields. Infection was sev. in 1/2 the Sask. fields and 1/4 of the Alta. and Man. fields, and heavier in the n. parts of the provinces. Scald (Rhynchosporium secalis) was mod. in Alta. and light in n.w. Sask. Speckled leaf blotch (Septoria passerini) affected half the fields in each province causing sl. damage in Sask. and sl.-mod. damage in Alta. and Man.

Variety tests of 6-row barleys were made at the following 5 places: Winnipeg, Brandon, and Morden, Man., Indian Head and Melfort, Sask. The 2-row varieties were tested at the following 6 places: Edmonton, Lacombe, and Lethbridge, Alta.; Tisdale and Saskatoon, Sask.; Winnipeg, Man.

The named 6-row varieties were susceptible to leaf spot (H. teres with with some H. sorokinianum) and the "4635" hybrids were resistant at all 5 stations. Of the 2-row barleys Canadian Thorpe and Freja were most resistant.

Scald (Rhynchosporium secalis) was serious only at Melfort, Sask. where Vantmore and "Meteor" hybrids showed resistance. Rivale, a 2-row variety was very resistant to scald which was present at all Alta. stations and sev. at Tisdale, Sask.

Speckled Leaf Blotch (S. passerini) was present at all 6-row test stations and "Meteor" and "53" hybrids were consistently resistant. Piroline was the most resistant 2-row barley.

Bacterial Streak (Xanthomonas translucens) was found at all 6-row barley test stations. The standard named varieties showed more resistance than some hybrids. It was recorded on 2-row varieties only from University of Saskatchewan.

Root Rot. 25 varieties were rated at Winnipeg, Morden, and Brandon 60 days after seeding. Varieties from one source rarely differed appreciably in rating. The varieties from North Dakota, Macdonald College and Guelph showed considerable resistance while Sask. and Alta. varieties were fairly susceptible in Man. The early varieties Edda, Olli and Br. 3902 were all susceptible. In malting barleys O.A.C. 21 was resistant; Montcalm, Parkland, A.M. 570 intermediate; and Olli was mod. susceptible. Vantmore had some resistance. Husky was mod. susceptible and Vantage susceptible. Herta, the only 2-row variety in the test, was mod. susceptible. (H.A.H. Wallace).

RYE

BLACK MOLD (Cladosporium herbarum) was found on Tetra Petkus rye heads sent in by growers to Botany Dept., Ont. Agr. Coll. (S.J. Fushtey).

ERGOT (Claviceps purpurea). Tr. infection was found on Storm rye in University plots, Vancouver, B.C. (H.N.W. Toms). A trace was reported in 1 field in Kings Co., N.S. (D.W. Creelman). See also Ergot Survey for reports from Western Canada.

POWDERY MILDEW (Erysiphe graminis). Sl. infection on Storm rye caused negligible damage at University plots, Vancouver, B.C. (H.N.W. Toms).

COMMON ROOT ROT (Helminthosporium sorokinianum and Fusarium spp.). Two fields had tr. infection out of 6 examined in s. Alta. (J.S.H.). and 4/8 had sl. infection in central Alberta (W.P.C.).

STEM RUST (Puccinia graminis). In s. Alta. infection was 1-mod./6 fields examined (J.S.H.). Trace infection was found in 1 field at Carlyle and in one nr. Swift Current, Sask. in examination of 5 fields (H.W.M.).

LEAF RUST (Puccinia secalina). Tr. infection occurred on Storm rye in University plots, Vancouver, B.C. (H.N.W. Toms). One sev. diseased field was found in 6 examined in s. Alta. (J.S.H.) and 2-sl. and 1-tr. infections were found in 3/8 fields in central Alta. (W.P.C.). Tr. infection was found in 2/5 fields at Carlyle and s. of Swift Current, Sask. (H.W.M.).

SCALD (Rhynchosporium secalis). One field at Beaver Lodge had tr. infection in 8 examined in Alta. (W.P.C.).

SPECKLED LEAF BLOTCH (Septoria secalis). Infections were 2-sl. 2-mod. in 4/8 fields examined in Alta. (W.P, C.).

BACTERIAL BLIGHT (Xanthomonas translucens). A trace was reported from 1/6 fields examined in Alta. (J.S.H.).

CEREAL RUSTS IN CANADA IN 1956

T. Johnston, G.J. Green, B. Peturson and D.J. Samborski

The complete report was issued as Report No. 12 by the Plant Pathology Laboratory, Winnipeg, Man., in February 1957. Of the 15 tables in the original report only the first is reproduced as Table 4 in this condensation. Figure 3 is adapted from the map in the same report.

Cereal Rust Development in Western Canada in 1956

In 1956, several factors favorable to cereal rust development operated throughout Western Canada. Seeding was delayed, rainfall was frequent and above normal, heavy dews were frequent, and the prevailing temperatures were favorable for rust development. Despite these favorable factors, very little rust occurred on cereals in the Prairie Provinces and there was almost no rust damage.

The low incidence of cereal rusts can be attributed largely to two factors: the scarcity of spores in the air and the culture of rust resistant cereal varieties over large areas in the north central parts of the United States and in the eastern part of the Prairie Provinces.

The low incidence of air-borne rust spores in May and June was conditioned largely by drought in Texas and adjoining areas. Despite rather

widespread drought during the winter the rusts of wheat and oats overwintered in Texas along the Gulf coast and by the middle of March oat stem rust was general in the south central parts of the state and was considered to present a serious threat. Crown rust was prevalent though less widespread, and stem rust and leaf rust of wheat were present though less commonly. However, the intensification of drought conditions in April destroyed much of the rusted crop and prevented further rust development with the result that little inoculum was produced in Texas for distribution to more northerly areas. The spore content of the air over the winter wheat belt was low and little rust developed on winter wheats.

In Western Canada, air-borne rust spores were much less numerous than for many years. The reduction in numbers of leaf rust spores as compared with former years was most marked. The tabulation below gives the total numbers of spores of leaf rusts and stem rusts caught in June and July on each square inch of the slides exposed in spore traps at Winnipeg, Morden and Brandon in Man. and at Regina in Sask. for 1956, 1955 and 1954.

Year	Stem Rust	Leaf Rust
1956	105	334
1955	3,740	5,870
1954	70,900	192,800

The fact that almost the entire wheat and oat acreage in Man. and eastern Sask. was sown to rust resistant varieties in 1956 strongly militated against any rapid increase of such rust inoculum as was blown in from the south. However, owing to very favorable conditions for rust development there was a surprisingly rapid increase of oat stem rust on wild oats and of wheat stem rust on wild barley (Hordeum jubatum) after the end of July, and in late August there was considerable development of leaf rusts and stem rusts wherever susceptible wheat and oat varieties could be found.

Stem Rust of Wheat:

The first infections were found on 22 June on fall-sown and headed Kharkov wheat at the University of Manitoba, Winnipeg. Further development of stem rust was very slow as is indicated by the failure on 26 July to find stem rust in farmers' fields in a trip through southern Man. At that date, however, stem rust was present in small infection centres on susceptible wheats at the Experimental Farm at Morden. At the end of the season, stem rust was negligible in farmers' fields, but infection had become severe on some late-sown susceptible wheat and oat varieties in experimental stations in southern Man. In Sask. stem rust was first reported at Saskatoon on 12 July. Further increase of the rust was slow; a month later there was only a

light, though rather general, infection on wheat in the southern and west central parts of the province. Subsequently, a light to moderate infection developed, chiefly on durum wheat, in an area extending about 100 miles north from Swift Current. (See Fig. 1). In Alta., stem rust was first collected 13 July at Lethbridge. The chief subsequent rust development occurred in south-central Alta. Infection was mostly trace to slight though heavy infection was observed on Lemhi soft wheat in the Lethbridge, Vauxhall, Brooks, and Strathmore districts. Occasional cases of severe infection were found as far north as Castor and trace infection northwards to Vermilion and Clandonald.

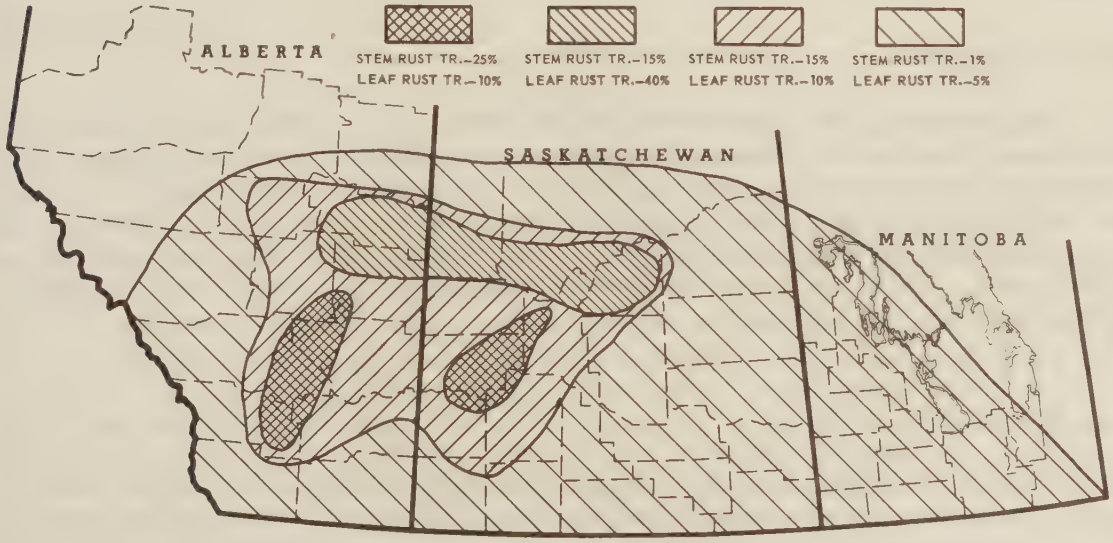

Fig. 1. Map of the Prairie Provinces showing approximate intensities of stem and leaf rust in 1956 on susceptible common wheat.

Leaf Rust of Wheat:

Two leaf rust pustules were found on Kharkov wheat on 17 May at the University of Manitoba, Winnipeg. The plots on which they occurred were heavily rusted in October, 1955 and were protected with a thick cover of snow from early November until spring. As numerous infections were found on these plots a few days later it is highly probable that the rust infection arose from overwintered spores and mycelium.

Apart from this outbreak the first infection of leaf rust was found near Winnipeg on 29 June, 16 days later than in 1955 and 13 days later than in 1954.

Further increase of leaf rust was very slow. On a trip through southern Man., 26-27 July, only a single leaf rust infection was observed in farmers' fields. At the middle of August infection was generally present in Man. but only in trace amounts. In Sask., at the same time, trace to slight amounts of rust were present throughout the southern part of the province, the incidence being greatest in the west central area where leaf-rust susceptible wheat predominates. Infection did not appear to be severe enough in any of the crops seen to cause appreciable damage. In Alta., leaf rust occurred at least as far north as Edmonton in light or trace amounts. At the end of the crop season, especially in Man., leaf rust infection increased considerably on late-sown susceptible varieties, as for example, in the rust nurseries at Brandon, Morden and Winnipeg.

Stem Rust of Oats:

Oat stem rust was first found on wild oats south of Winnipeg on 11 July, exactly three weeks later than in 1955. Owing to weather favorable to rust infection this rust increased rather rapidly on wild oats in southern Man., but it had little opportunity to develop in farmers' fields as the rust resistant varieties Rodney and Garry were grown on more than 80% of the Man. acreage seeded to oats. Infection diminished westwards but occurred in trace or light amounts as far west as Lacombe, Alta.

Crown Rust of Oats:

Crown rust was first seen near Winnipeg on wild oats on 10 July. The date of its appearance was nearly four weeks later than in 1955. At the middle of August crown rust could be found in most oat fields in southern Man. in amounts ranging from trace to 5%. Most oat fields seen were sown to the moderately resistant varieties Rodney and Garry. That late-sown, susceptible oat varieties might be damaged by crown rust infection was indicated by a 70% infection on late-sown Exeter at the Brandon Experimental Farm. Infection diminished westwards and was not reported west of central Sask.

Other Cereal Rusts:

Leaf rust of barley was found only in southern Man. in trace amounts. Trace and very light infections of stem rust of rye were found in a few places in Man. and Sask. and leaf rust of rye occurred in amounts diminishing from light or moderate in Man. to trace or light in areas west of central Sask.

Cereal Rusts and Other Diseases in the Rust Nurseries

A summary is given below of observations on diseases occurring on varieties of wheat, oats, barley and rye grown in 1956 in the uniform rust nurseries. These observations are recorded in Table 4.

The cereal varieties grown in the rust nurseries in 1956 were as follows: Wheat: McMurachy, Lee, Kenya Farmer, Little Club, Marquis, Mindum, Thatcher, Selkirk, Redman, Exchange and Frontana. Oats: Bond, Trispernia, Exeter, Garry, Clinton, Landhafer, and Rodney. Barley: Montcalm, Black Hulless, Vantage, and Feebar. Rye: Prolific.

Wheat Stem Rust:

In the rust nurseries in Western Canada, stem rust occurred in appreciable amounts only in those in Man. and at Indian Head, Sask., Lethbridge, Alta., and Creston, B.C. (Table 4). In Ont. and Que., there was moderate infection in the nurseries except at St. Catharines and Kapuskasing, Ont. and Normandin, Que. In the Maritime Provinces, infection was light or absent except at Kentville, N.S., where a moderate amount of rust developed.

The reaction of the varieties to rust calls for only a few comments. McMurachy carried appreciable rust infection only at Winnipeg and in several rust nurseries in Ont. and Que. where infection of 20 to 30% was common. Race analysis has shown that the infection was caused chiefly by races 29 and 48A. These same races caused infection on this variety in Eastern Canada in 1955 and in 1954. Before 1954 McMurachy was almost free from stem rust in the rust nurseries. Selkirk, though it is descended from McMurachy and contains rust-resistance genes derived from it, was almost free from stem rust at all points.

The rusting of McMurachy in Eastern Canada was evidently due to the presence of races 29 and 48A and its resistance in Western Canada was the result of the scarcity of these races in the respective areas. Presumably, the annual source of stem rust inoculum is the same -- the southeastern States and northeastern Mexico. But there is reason to suppose that a barrier of wheat varieties resistant to these races largely prevents their movement through the north-central States into Western Canada.

Lee, Thatcher, and Redman showed very little stem-rust infection at most places and Kenya Farmer and Frontana showed high resistance.

Table 4: Incidence of certain pathogenic fungi on wheat, oats, barley and rye at 35 locations in Canada in 1956.

Locality	WHEAT					OATS			BARLEY				RYE	
	P. gr. tritici	P. triticina	Erysiphe graminis	Septoria nodorum	S. avenae f. sp. triticea	P. gr. avenae	P. cor. avenae	S. avenae f. sp. avenae	P. graminis	P. hordei	Erysiphe graminis	S. passerinii	P. gr. secalis	P. secalina
Saanichton, B.C.	0	2	2	0	2	0	0	0	0	0	0	1	0	0
Agassiz, B.C.	0	0	-	0	1	0	0	3	0	0	0	0	0	0
Creston, B.C.	4	4	0	1	0	1	0	0	3	0	1	0	3	3
Beaverlodge, Alta.	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Edmonton, Alta.	1	1	1	0	0	1	0	0	0	0	0	0	0	1
Lethbridge, Alta.	2	2	-	1	3*	0	0	0	1	0	0	0	0	0
Lacombe, Alta.	1	2	0	0	4*	1	0	0	0	0	0	4	0	2
Scott, Sask.	1	2	-	-	-	2	0	-	1	0	-	-	0	0
Melfort, Sask.	1	3	0	2	0	1	1	0	1	0	0	3	0	1
Indian Head, Sask.	2	3	0	3	0	1	1	0	0	0	0	4	1	3
Dauphin, Man.	3	3	4	0	2	2	2	-	1	0	0	4	1	4
Brandon, Man.	3	4	0	2	3	3	4	0	1	0	0	4	1	4
Morden, Man.	4	4	0	0	4	4	2	2	1	1	0	4	1	4
Winnipeg, Man.	3	4	0	2	3	4	4	2	1	0	0	4	1	3
Fort William, Ont.	2	2	-	3	3	2	1	2	1	0	1	0	0	3
St. Catharines, Ont.	1	3	4	0	0	1	2	0	0	0	2	0	0	2
Guelph, Ont.	3	4	2	3	0*	4	4	2	1	4	4	1	1	4
Mindemoya, Ont.	3	4	0	0	0	3	4	2	1	2	3	0	2	3
Kemptville, Ont.	3	4	3	0	0	3	4	-	1	1	4	0	1	2
Ottawa, Ont.	4	4	-	2	2	-	4	-	-	4	-	-	0	2
Merrickville, Ont.	-	-	-	-	-	-	3	-	-	3	-	-	1	2
Appleton, Ont.	-	4	-	0	1	-	-	-	1	3	-	-	1	2
Williamstown, Ont.	-	4	-	-	-	-	-	-	-	3	-	-	-	3
Kapuskasing, Ont.	1	1	0	0	2	0	0	3	0	0	0	3	0	0
Macdonald College, Que.	4	4	2	2	0	2	3	0	2	4	4	-	1	4
Lennoxville, Que.	3	4	0	2	0	2	0	3	1	1	0	0	0	4
L'Assomption, Que.	4	4	-	0	1	2	1	3	1	0	1	3	0	2
Ste. Anne de la Poc., Que.	2	4	0	1	0	3	2	4	1	2	0	0	1	2
Normandin, Que.	0	3	-	0	2	0	0	4	0	2	0	4	0	2
Fredericton, N.B.	-	-	-	1	1	1	1	-	2	1	0	0	3	0
Kentville, N.S.	3	4	4	1	0	1	2	3	1	2	0	0	2	4
Pictou, N.S.	0	3	0	0	0	1	1	0	0	0	0	0	0	0
Nappan, N.S.	1	3	4	1	0	1	0	2	0	0	0	0	0	3
Charlottetown, P.E.I.	2	4	0	3	0	2	1	3	0	2	-	1	1	2
St. John's West, Nfld.	0	0	-	-	-	-	0	-	0	0	-	-	0	0

* Septoria tritici present on wheat.

Note: 1 = trace, 2 = light, 3 = moderate, 4 = heavy, - = no observations made for the rusts 1 = tr - 1%. 2 = 2-20%, 3 = 25 - 50%, 4 = above 50%

Wheat Leaf Rust:

The considerable amount of leaf rust on susceptible varieties in the Western rust nurseries does not adequately reflect the fact that 1956 was a "light" rust year (Table 4). The rust nurseries were sown later than most farmers' fields and, consequently, leaf rust, despite its late arrival, had opportunities to develop considerably before wheat matured in the nurseries.

As pointed out in last year's report there was then evidence for an increase in Western Canada of races and biotypes capable of attacking Lee rather vigorously in the seedling stage. Despite the fact that such rust strains have shown further increase this year there was little leaf rust present on Lee in 1956 either in the rust nurseries or in farmers' fields. It seems likely, as stated elsewhere in the present report, that Lee has considerable mature-plant resistance which protects it, in the field, from severe rust infection.

A point of some interest is that Redman showed resistance at St. Catharines, Kemptville, and Appleton, Ontario; at Lennoxville, L'Assomption, Ste. Anne de la Pocatiere, and Normandin, Quebec; and at Pictou and Nappan, N.S., but was susceptible at certain other points in Eastern Canada, as at Guelph and Mindemoya, Ont., Macdonald College, Que., and Kentville, N.S. This variety has behaved similarly in past years. Presumably it is resistant where the rust is composed mainly of race 58 to which it is resistant.

The varieties Exchange and Frontana showed definite resistance at all stations.

Oat Stem Rust:

The distribution of rust races was definitely reflected in varietal reaction. Rather high percentages on Clinton were indicative of the high prevalence of race 7. That the race group 8-10-11 was much less common was indicated by the low percentages on Exeter. Race 7A, the only stem rust race to which Rodney is susceptible, was not sufficiently common to produce any appreciable amount of rust on it.

Crown Rust of Oats:

In the Western nurseries heavy infection occurred only in those at Brandon and Winnipeg, Man., and this rust was not found in nurseries west of Indian Head and Melfort, Sask. In Eastern Canada fairly heavy infection developed in the nurseries in eastern Ont., and at Macdonald College, Que., but elsewhere infection was light or absent.

Except at Mindemoya, Ont., there was little rust on Garry and Rodney and only a trace was found on the important breeding variety Landhafer. However, two races, 263 and 276, which attack Landhafer in the seedling stage were isolated from rust samples collected in the rust nurseries. Race 263 was found at Merrickville, Ont., and at Winnipeg whereas race 276 was found at Winnipeg only.

Rusts on Barley:

Stem rust caused severe infection on barley only at Creston, B.C. Although rye stem rust as well as wheat stem rust was heavy at this station it is clear, as a result of isolation studies, that the rust on barley was wheat stem rust, principally races 11 and 59. The only other stations at which appreciable stem rust infection occurred on barley were Macdonald College, Que. and Fredericton, N.B. At the latter place the infection was caused by rye stem rust as has been the case at this station in previous years.

Leaf rust of barley was seen at only 1 station in Western Canada but occurred at 14 stations in the Eastern provinces.

Infection by rye stem rust was absent or light except at Creston, B.C., and Fredericton, N.B.

Diseases Other Than Rusts

Powdery mildew (Erysiphe graminis) was seen on wheat in 9 out of the 23 nurseries on which observations were made for its presence (Table 4) but infection was severe only at 4 points: Dauphin, Man., St. Catharines, Ont., and Kentville and Nappan, N.S. Powdery mildew was observed on barley in 8 of 28 nurseries examined. Except for a trace infection at Creston, B.C., it was found only in the nurseries in Ont. and Que.

Speckled leaf blotch of barley (Septoria passerinii) was severe only in the nurseries in Man. and eastern Sask. and at Lacombe, Alta. It was less prevalent in Eastern Canada where it was found in only 5 of the 15 nurseries observed.

Speckled leaf blotch of oats (Septoria avenae f. sp. avenae) was found in 11 of the 14 Eastern Canada nurseries examined but in Western Canada it was found only at Winnipeg and Morden, Man., and at Agassiz, B.C.

In addition to the diseases recorded in Table 4 several others occurred in the rust nurseries but no systematic observations were made on them. Net blotch of barley (Helminthosporium teres) was found in only 2 stations in Eastern Canada (Fort William and Kemptville, Ont.) of 11 examined, but in Western Canada this disease was moderate or heavy in 4 stations (Creston, B.C., Melfort, Sask., and Brandon and Dauphin, Man.) out of 9 examined.

Distribution of Physiologic Races

Puccinia graminis var. tritici

In 1956 collections of wheat stem rust from nearly every province in Canada yielded 315 isolates. Nineteen races and subraces were identified. These races (number of isolates in brackets) are: 11 (40), 11-Can. 1 (23), 15 (1), 15B (59), 15B-Can. 4 (69), 29-Can. 1 (10), 29-Can. 2 (14), 32 (3), 34 (3), 39 (3), 48 (1), 48A (15), 56 (67), 59 (2), 59C (1), 87-Can. 1 (1), 87-Can. 2 (2), and 147 (1).

Wheat stem rust races were identified on 6 standard differential varieties: Marquis, Reliance, Arnautka, Mindum, Einkorn and Vernal. Whenever there was doubt as to the correct identity of a culture reactions were determined for the varieties Kota, Spelmar, Kubanka, Acme and Khapli, which complete the set of standard differential hosts. The accessory varieties used in both 1955 and 1956 were Lee, Golden Ball, Selkirk, Kenya Farmer, McMurachy, Kenya 321 B. T. 1. B. 1, Kenya 117A, and Mayo 54. The variety Bowie replaced Selection 131 in 1956. The varieties Ramsey, Mida-McMurachy-Exchange 11-47-26, Yuma and Langdon were added to the accessory hosts in 1956, whereas, Thatcher, Kenya 58 F(L), and Kenya 360H, used in 1955, were omitted in 1956. Kenya 321 B. T. 1. B. 1 was replaced by the new durum variety Ramsey when the survey was about half completed because the Kenya variety appeared to have little value as a differential.

The most important changes in the race pattern in 1956 are in the prevalence of known races rather than in the appearance of new races. There was a reduction in the prevalence of the race 15B complex from 66% of the isolates in 1955 to 40% in 1956. A subrace of 15B (15B-Can. 4), which can attack certain durum wheats such as Golden Ball and Ramsey, increased greatly in prevalence, whereas, the ordinary form of 15B, which attacks neither Selkirk nor Golden Ball, diminished in prevalence to 18% of the isolates from 61% in 1955 and 76% in 1954. Some cultures of the ordinary 15B have considerably greater virulence on the new durum varieties Yuma and Langdon than other cultures of the race. The well-known race 56 was next in prevalence to 15B, constituting 21% of the isolates. This race has been increasing in prevalence for several years. An increase in the prevalence of race 11 to 20% of the isolates paralleled the increase of race 56. About one-third of the race 11 isolates belonged to the subrace 11-Can. 1 which is virulent to Golden Ball. Two subraces of race 29 (29-Can. 1 and 29-Can. 2) were isolated which are moderately virulent to Selkirk. Race 48A was as prevalent as in 1955 and for the first time a culture of this race that was virulent to Selkirk was obtained. Other interesting races isolated rarely are: race 15 which has considerable virulence on Langdon and Yuma; race 32 which can attack Selkirk, McMurachy and Mayo 54; race 87-Can. 2 which can attack Golden Ball and Selkirk; and race 147 which is more virulent on Langdon than on Yuma.

In the study of the reaction of accessory hosts to the races isolated in 1956, the varieties Lee, Golden Ball, Selkirk, Bowie and McMurachy have been the most valuable for distinguishing subraces of practical importance. The reactions of the durum variety Yuma closely resemble those of Langdon except that race 147 is less virulent on Yuma than on Langdon. Kenya Farmer (Kenya 338 AC.2.E.2), and Mida-McMurachy-Exchange 11-47-26 were resistant to all the cultures to which it was tested. Three cultures of race 32 were isolated which could attack Mayo 54. This variety sometimes produced a (2) to (3) type of reaction to this race but in several tests it showed complete seedling susceptibility.

At the rust conference in Mexico City, March, 1956, a number of varieties were suggested as new international differential hosts. These varieties, excluding those already among our accessory hosts, and the susceptible variety Prelude, were tested to 46 cultures (16 races and subraces) obtained in 1956. (Illinois x Chinese^2) x Timopheevi is a good differential for a number of these races but did not distinguish between race 15B and races 15, 32, 87 and some cultures of race 11. Triticum timopheevi, Fontana-K-58-New Thatch II - 50-17, and Khopstein do not appear to be especially useful at the present time.

Stem Rust on Barley

All collections of stem rust on barley and wild barley (Hordeum jubatum) were tested on Little Club wheat and Rosen rye to determine the presence of wheat and rye stem rust. In all, 40 isolated of wheat stem rust and 15 of rye stem rust were obtained. The distribution by province was as follows:

Province	Wheat Stem Rust	Rye Stem Rust
N.B.	0	2
Ont.	4	0
Man.	22	9
Sask.	9	3
Alta.	5	1

In Manitoba, rye stem rust appeared earlier than wheat stem rust and could be found easily on wild barley before rust appeared in nearby wheat fields. This gave rise to the relatively large number of rye stem rust isolates from that province.

Rye stem rust was somewhat more common on barley and wild barley than in 1955 but, with the exception of the area about Fredericton, N.B., it does not appear to be a factor in barley production.

Puccinia triticina

In the identification of races, each rust collection was initially increased on the susceptible variety Little Club. When infections were well developed, two single-pustule isolates were established and used for race identification. These isolates served the purpose of random sampling. The remainder of each original culture on Little Club was used to inoculate a "screening" set composed of the varieties Exchange, Kenya Farmer, Lee, Frontana, Selkirk, Klein Titan and Langdon. The purpose of this procedure was to ascertain the presence of any rust strains particularly virulent to one or another of these varieties.

Altogether 336 isolates were studied and identified, as to race, as follows (number of isolates in brackets): 1 (6), 5 (35), 9 (4), 11 (22), 15 (129), 35 (14), 58 (70), 126 (42), 140 (4).

In 1956, as in 1955, the majority of isolates from the Prairie Provinces were virulent to Hope and H44 derivatives. In other parts of the country these strains occurred much less frequently.

The race distribution in 1956 differed from that of 1955 chiefly in the decreased prevalence of race 5 (10.4% in 1956 and 30.0% in 1955). Race 15 was the most prevalent race while second in order of prevalence was race 58. Regional distributions of these two races expressed as a percentage of the total isolates in the respective areas were as follows: In Man., Sask., Alta., race 15 (58.0), race 58 (2.5); in Ont. and Que., race 15 (6.1), race 58 (57.0).

Analysis by the screening set showed a marked increase in 1956 in the number of isolates virulent to seedling leaves of Lee. Since there was little leaf rust on Lee in the rust nurseries or elsewhere in Canada, it is probable that Lee possesses adult plant resistance to many of these isolates. In general, Lee and Kenya Farmer show marked similarities in their reactions to leaf rust isolates. However, some isolates are virulent to Kenya Farmer but cannot attack Lee.

Langdon was susceptible in the seedling stage to many of the isolates, particularly those from Eastern Canada. It showed susceptibility to some isolates of all common races - most isolates of race 58 and about 25% of race 15 isolates from Man. and Sask. were virulent to Langdon.

The other varieties in the screening set were susceptible in the seedling stage to only a few isolates in 1956 - Exchange (2), Frontana (3), Selkirk (2), Klein Titan (3). One culture of race 58 attacked seedling leaves of Mindum.

Puccinia graminis var. avenae

In 1956 oat stem rust collections yielded 159 isolates made up of 11 races. The races isolated (number of isolates in brackets) are: 1 (6), 2 (3), 4 (7), 5 (1), 7 (98), 7A (11), 8 (18), 10 (5), 11 (7), 12 (1), and 13 (2).

Race identification was carried out as in the past several years. Rust collections were increased on the susceptible variety Victory and then were inoculated to the standard differential varieties White Russian, Richland, and Sevenothree, and to the varieties Rodney, which is susceptible to race 7A only, and Garry, which is resistant to all races.

The races isolated and their distribution differed little from 1955. Again in 1956, race 7 (61% of the isolates) predominated in most parts of the country and race 8 (11.3%) was next in order of prevalence. Race 6, which was uncommon but widely distributed in 1955, was not isolated in 1956, but the rather similar races 4 and 13 occurred in a number of collections from Eastern Canada. The increase in the prevalence of race 7A from 2.7% of the isolates in 1955 to 6.9% in 1956 was of interest because nearly all the isolates of this race were obtained in Man. where Rodney occupies 66% of the oat acreage. Of the 10 Man. isolates of this race 6 were obtained from Rodney.

Puccinia coronata var. avenae

Collections of crown rust were obtained from many localities in Eastern and Western Canada in 1956. Isolates from these collections were identified on the basis of rust reactions produced on the 10 regular differential hosts, Anthony, Victoria, Appler, Bond, Landhafer, Santa Fe, Ukraine, Trispernia, Bondvic, Saia, and the two accessory hosts, Garry and Rodney. The two accessory hosts are now the predominant oat varieties grown in Western Canada and are becoming increasingly common in Eastern Canada, and it was thought advisable to get as much information as possible about their response to the races and sub-races of crown rust present.

In all, 36 races and sub-races were identified from 132 isolates studied. Six races, 201, 202, 209, 212, 239 and 240 and their sub-races comprised 64.4% of the isolates identified. In 1955 these six races comprised 68.0% of all isolates. The remaining races and sub-races were much less prevalent, 8 being isolated only once and 11 only twice.

Seven races (251, 263, 274, 276, 279, 284 and 285) were isolated for the first time in Canada. However, all these seven races have been previously found in the United States and one of them, 263, was isolated by Dr. Marr D. Simons, Ames, Iowa, in 1953 from a collection made in Canada. Two of the races, 251 and 284, do not attack the varieties used in breeding for crown rust resistance and are of no greater importance than the common crown rust races. The other five races, 263, 274, 276, 279 and 285 are of particular significance because each one of them can heavily attack all our commercial varieties and one or more of the varieties used as resistant parents in breeding for crown rust resistance. Race 263 heavily attacks Trispernia, Landhafer, Santa Fe and Bond but not Ukraine and Victoria. Race 276 heavily attacks all the last named six varieties except Victoria, and races 274, 279 and 285 can all attack Victoria.

Garry is resistant to 18 of the races and sub-races identified and susceptible to 18, while Rodney is resistant to 22 of the races and sub-races and susceptible to 14. Rodney was resistant to 80% and Garry to 73% of the isolates studied.

The races and sub-races identified (number of isolates in brackets) were: 201 (7), 202 (23), 203 (5), 205 (2), 209 (15), 210 (4), 211 (3), 212 (10), 213 (1), 228 (2), 229 (1), 230 (1), 231 (3), 234 (4), 235 (5), 236 (2), 237 (1), 238 (1), 239 (14), 240 (20), 251 (1), 263 (2), 274 (1), 276 (3), 279 (3), 284 (3), and 285 (1).

Isolates from aecia collected on Rhamnus cathartica in 1956

In 1956, aecial collections were obtained from Rhamnus cathartica from Eastern and Western Canada. Spores from these collections were transferred to the grass hosts which differentiate the various varieties of crown rust that are known to occur in Canada. Three varieties avenae, secalis and festucae were isolated. Of these, the variety avenae was the commonest. Sixteen isolates of this variety were obtained and the isolates yielded 7 races as follows (number of isolates in brackets): 202 (1), 209 (2), 212 (4), 228 (3), 231 (3), 239 (5) and 240 (6).

ERGOT IN CEREALS IN WESTERN CANADA IN 1956

R. A. Shoemaker

The incidence of ergot in cereals in Western Canada was estimated by means of surveys made in 1956. Summaries of the results were prepared for each of the Prairie Provinces by W. L. Gordon and W. Popp, Man., H. W. Mead, Sask., and W. P. Campbell, Alta. Their data are presented in Table 5. The results of similar surveys conducted in 1953, 1954, and 1955 appeared in P. D. S. 33:23-28; 34:30-32; and 35:29-31. For ease of comparison the percentage of fields with ergot found in the previous surveys is included at the end of Table 5.

There was a general decrease in the percentage of wheat and barley fields affected by ergot. The largest percentage of affected fields continued to be in Man. followed by Sask. and Alta. Ergot was present on cereals in tr. amounts in Man. In Alta. ergot occurred on wheat in the central part of the province but only in tr. amounts. The sole record from Alta. of ergot on barley was of one field which had a tr. amount at Lloydminster.

Although ergot was more prevalent on wheat and barley in Man. than in Alta. and Sask., it was present in most of the rye fields surveyed in each province. The Man. reports indicated tr. amounts of the disease whereas some Alta. rye fields were severely infected. In s. Alta. six fields examined were rated 2-tr. at Carmangay and Mossleigh, 2-mod. at Carseland and Strathmore, and 1-sev. /2 at Lethbridge (J. S. Horricks). The following ratings were recorded from 7/8 fields in central and n. Alta., 3-tr. 1-3%, 1-30%, 1-40%, 1-50% (W. P. C.) with mod. to heavy infections in experimental plots at Edmonton (A. W. Henry).

Ergot was reported on a number of grasses from Alta. and Sask. The detailed reports are given in the section for cultivated and other grasses. A summary of W. P. Campbell's 43 observations is as follows: Agropyron spp. 8, Bromus inermis 21, Calamagrostis spp. 4, Elymus innovatus 7, Festuca rubra 2, Phleum pratense 1. Ergot occurred in a high proportion (10/15) of fields of Bromus sp. observed in Sask. and on brome grass planted on roadsides (H. W. Mead).

Man. had the highest percentage of wheat and barley fields affected by ergot but in all three provinces the disease occurred only in tr. amounts on these crops. A high percentage of the rye fields in each province was affected by ergot but sev. infections were reported only from Alta., the province with the lowest percentage of ergot in wheat and barley.

Table 5. Fields of Cereals inspected for Ergot by Province and Crop District in 1956

Crop District	Wheat						Barley						Rye					
	Man.		Sask.		Alta.		Man.		Sask.		Alta.		Man.		Sask.		Alta.	
	Total	Ergot	Total	Ergot	Total	Ergot	Total	Ergot	Total	Ergot	Total	Ergot	Total	Ergot	Total	Ergot	Total	Ergot
1	-		13						2						1			
2	8		15				9		3						0			
3	12	4	29				11	4	10						0			
4	3	2	13				2		1				1	1	2	2		
5	-		16		26		1		5	1	4				0		1	
6	-		31	5	40	2	1		2		21				1	1		
7	2		31		22	1	2		0		5				0		4	4
8	5	1	18	4	22		5		2	1	38		1	1	0			
9	6	1	28	2	0		7		3		0				1	1		
10	3				26		8				21	1						
11	3				6	1	5				23							
12	2				2		1				12							
13	-				0		-				0							
14	-				2		-				22						2	2
15					10						21							
16					59						91						1	1
17					20						12							
B.C.*					21						19							
Total	44	8	194	11	256	4	52	4	28	2	289	1	2	2	5	4	8	7
% Ergot																		
1956		18.2		5.7		1.6		7.7		7.1		0.3		100		80.0		87.5
1955		28.6		3.9		4.7		16.7		8.9		3.0		95.5		83.3		52.6
1954		11.9		2.1		3.1		26.1		11.1		5.3		100		50.0		17.9
1953		7.0		10.4		13.3		7.1		20.7		7.2		100		66.7		53.4

*Peace River Block of B.C.

II. DISEASES OF FORAGE AND OTHER FIELD CROPS

A. FORAGE LEGUMES

ALFALFA

BLACK STEM (Ascochyta imperfecta) was common and caused sl. damage to second growth alfalfa at Chilliwack; other infections were 2-tr.-sl. at Kamloops, 3-sl.-mod. at Galloway, and 2-tr.-sl. at Joffray, (E.J. Hawn, W.R. Foster) and 1-tr. nr. Dawson Creek, B.C. (W.P. Campbell). Present in s. Alta. in amounts comparable to 1955; 2-tr. 3-sl./28 fields (M.W. Cormack, E.J.H.). In n. and central Alta. infections were 2-tr. 13-sl. 15-mod. 5-sev./ 141 (W.P.C., J.B. Lebeau). In Sask. black stem developed slowly but after 1 July was prevalent in all 56 fields and plots examined and caused mod. damage (H.W. Mead). Sl.-mod. infections were general in Man. Sev. infections were observed on unthrifty crops grown in poor soil (W.C. McDonald).

LEAF SPOT (Cercospora zebrina) was common in plots at Winnipeg, Man., particularly on the variety Socheville and the Saskatoon line S 239 (W.C. McD.).

DOWNY MILDEW (Peronospora aestivalis) was found in tr.-sl. amounts nr. Merritt, B.C. (E.J.H., W.R.F.). Sl.-mod. amounts occurred on scattered plants in plots at Lethbridge, Alta. (E.J.H.). One field near Wembley was sev. affected /30 observed in n. and central Alta. (W.P.C.). Mod. infections occurred in plots at Brandon and Winnipeg, Man. The disease was sufficiently severe and uniform so that disease readings could be made on 2 replications of a group of 50 varieties and lines. Rhizoma, E44 and E153 appeared to be highly resistant (W.C. McD.).

ROOT ROT (Plenodomus meliloti) affected 15/141 fields surveyed in n. and central Alta. Infections were 8-tr. 6-sl. 1-sev. (J.B. Lebeau, W.P.C.).

YELLOW LEAF BLOTCH (Pseudopeziza jonesii). Ratings were sl.- mod. at Kamloops, Soda Creek, Whiskey Creek and Vernon, and mod.-sev. on second growth in the Bridesville and Kettle Valley areas of B.C. (E.J.H. and W.R.F.). In the Peace River area of Alta. 20/30 fields were affected at the following amounts: 2-tr. 13-sl. 4-mod. 1-sev. (W.P.C.). Sl. damage was found in 10/56 fields surveyed in Sask. (H.W.M.).

COMMON LEAF SPOT (Pseudopeziza medicaginis) was widespread but caused sl. damage on second growth alfalfa at Kamloops, Rosedale, Merritt, Whiskey Creek and Joffray, B.C. (E.J.H. and W.R.F.). In n. Alta. 27/30 fields were affected as follows: 11-tr. 8-sl. 7-mod. 1-sev. (W.P.C.). In central Alta. 6 fields were sl. and 1 was sev. affected out of 111 examined (J.B. Lebeau). Second growth alfalfa in plots at Lethbridge was sl.-mod. affected. Infection was 1-tr. 6-sl. in 7/28 fields examined in s. Alta. (M.W. Cormack, E.J.H.). In Sask. the disease was more prevalent than in previous

years; 25/56 fields were sl. affected (H.W.M.). Hay crops were sl. damaged and later in the season seed crops suffered mod. damage in Man. (W.C.McD.). In Ont. only tr. amounts were found early in the season. Considerable defoliation, particularly on second-cut fields, occurred later in the summer (L.V. Busch). Tr.-mod. infection was noted in Queens Co., P.E.I. (R.R. Hurst).

LEAF SPOT (Pseudoplea briosiana = P. trifolii) combined with boron deficiency caused sev. yellowing and defoliation in an 8-acre field in King's Co., N.S. (D.W. Creelman).

CROWN BUD ROT (Rhizoctonia solani, Fusarium spp., etc.) was present in irrigated stands of plants 2 years old and older. Ratings made on samples from 23 fields showed sl.-sev. infection in 21. The intensity of the disease was directly correlated with the age of the plants (E.J.H. and W.R.F.). All 28 irrigated fields examined in Alta. were damaged (E.J.H.).

CROWN AND FOOT ROT (Rhizoctonia sp. and Fusarium sp.) is the most serious disease of alfalfa and red clover in s.-w. Ont. Only the upper inch or two of the root and crown are affected while the remainder of the root is usually sound. This disease is very seriously reducing stands of clover and makes reseeding necessary every 2 or 3 years (L.V. Busch).

LEAF SPOT (Stagonospora meliloti) was found causing sl. damage in 1 field nr. Edmonton in a survey of 141 fields in n. and central Alta. (J.B. Lebeau).

LEAF SPOT (Stemphylium botryosum). Thirty fields were surveyed in n. Alta. and an adjacent portion of B.C. Four fields nr. Dawson Creek, B.C. were found to be diseased as follows: 2-tr. 1-sl. 1-mod. (W.P.C.).

WINTER CROWN ROT (low-temperature basidiomycete)caused sl.-mod. damage in patches in 6 fields in s. Alta. (M.W. Cormack, E.J.H.). In central and n. Alta. 69/141 fields were affected as follows: 9-tr. 25-sl. 20 mod. 15-sev. (J.B. Lebeau, W.P.C.). Two-year-old plants in scattered areas of a variety test plot at Winnipeg were dead in the spring. Isolations from rotted crowns showed the presence of the basidiomycete; the first record of its occurrence s. of the Duck Mountains in Man. (W.C. McD.).

ROOT ROT (various fungi). Root and crown lesions were found on plants that had wilted and turned brown. Most of the damage occurred in plots at Saskatoon. The av. damage was sl. in 10/56 fields surveyed in Sask. (H.W.M.).

BACTERIAL WILT (Corynebacterium insidiosum) was widespread and occurred in mod. - sev. amounts in 32/41 irrigated fields in B.C. The disease

also occurred in low areas of dry-land stands of alfalfa nr. Creston (E.J.H., W.R.F.). Infections were 5-sl. 8-mod. 1-sev. in 14/28 fields in s. Alta. (E.J.H.) and 5-tr. 6-sl. 4-sev. in central Alta. No infection was noted in the Peace River area (W.P.C., J.B.L.). Infection ranged from 10 to 40% and caused sl.-sev. damage in 200 acres of alfalfa inspected nr. Smithville, Ont. Extensive damage was caused in certain areas of 2 fields comprising a total of 14 acres near Sterling. Infection was estimated at 10-15% (J.A. Carpenter).

WITCHES BROOM (virus) caused sev. stunting in 1 field. Sl.-mod. damage was observed in 3/17 fields nr. Kamloops. Tr.-sl. damage was noted in 4 other fields in B.C. (E.J.H., W.R.F.).

ROSETTE (associated with spittle bug feeding) was mod.-sev. in 3 areas and sev. in 2 other areas of B.C. (E.J.H., W.R.F.).

WINTER KILLING was observed in the Peace River district of n. Alta. Many fields were wholly or partially lost. The low temperatures came before the fields were covered with snow following a warm fall (W.P.C.). At Saskatoon, Sask. alfalfa varieties that normally are winter-hardy were damaged by sub-zero weather that occurred in the early spring after the snow had melted (H.W.M.).

COMMON CLOVER

LEAF SPOT (? Cercospora zebrina) caused mod. damage in 16 fields and sl. damage in 2 fields /21 of red clover examined. The infected fields were mostly in n.-e. Sask. (H.W. Mead). Sl. infection occurred in alsike plots at Winnipeg, Man. (W.C. McDonald).

SOOTY BLOTCH (Cymadothea trifolii). One mod. infection /17 alsike fields in central Alta. (J.B. Lebeau) and mod. infection along roadsides near Edmonton (A.W. Henry). Late in the season moderate infection of alsike was evident in plots at Winnipeg, Man. (W.C. McD.).

POWDERY MILDEW (Erysiphe polygoni) was observed on red clover growing on roadsides. However, no damage has been observed in crops in B.C. during the past 10 years (H.N.W. Toms). Sl. infection was reported in 2 fields, one of alsike and the other of red clover nr. Hillspring out of 6 fields examined in s. Alta. Plots of red clover and Altaswede clover also had sl. infection at Lethbridge (E.J. Hawn). One mod. infection nr. Spirit River, Alta. was found out of 6 fields examined in central and n. Alta. (W.P.C.). Red clover in plots at Saskatoon occasionally exhibited symptoms. (T.C. Vanterpool). Sl. damage was caused to red clover in Queen's Co., P.E.I. (R.R. Hurst).

NORTHERN ANTHRACNOSE (Kabatiella caulivora) was much less sev. in n. and central Alta. than in the past 3 years. Infections were 1-tr. 5-sl. 1-mod. in 7/8 fields examined (W.P.C., J.B. Lebeau). Sev. infection was noted in variety test plots at Ste. Anne de la Pocatiere, Que. (D. Leblond).

ROOT ROT (Plenodomus meliloti) infections were 2-tr. 3-sl. 1-mod. 1-sev. in 7/17 alsike clover fields in central Alta. (J.B.L.).

LEAF SPOT (Stagonospora meliloti) occurred in mod. amounts on alsike clover at St. Clement, Que. (D. Leblond).

LEAF SPOT (Stemphylium sarcinaeforme) affected 4 fields of red clover nr. Dawson Creek, B.C.; 1-tr. 3-sl. (W.P.C.).

WINTER CROWN ROT (low-temperature basidiomycete) occurred in 2 red clover fields in central Alta. and caused mod. damage (J.B. Lebeau). All 17 alsike fields examined in central Alta. were affected; 4-sl. 8-mod. 5-sev. Most fields in the Peace River district were completely killed (W.P.C.).

PHYLLODY (? virus) was mod. - sev. in ladino clover plots at Ste. Anne de la Pocatiere, Que. (D. Leblond).

LEAF CHLOROSIS See Hrushovetz, S.B., J.B. Lebeau and H.B. Stelfox. Production of leaf chlorosis in red clover by the addition of chemicals to the soil. Plant Dis. Reporter. 41:120-122. 1957

SWEET CLOVER

GRAY STEM CANKER (Ascochyta caulicola) affected 17/22 fields examined in Sask. Damage averaged sl. and was sl.-mod. on sweet clover varieties at Saskatoon and occurred in fields in n.e. Sask. (H.W. Mead). Sl.-mod. infections were general in Man. (W.C. McDonald).

SUMMER BLACK STEM & LEAF SPOT (Cercospora davisii). Spotting of lower leaves was sl. in June and increased throughout the summer. Sl.-mod. infections of stems and pedicels were common during late summer. Virus-infected Brandon Dwarf plants were sev. damaged by black stem at Brandon, Man. (W.C. McDonald).

ROOT ROT (Fusarium culmorum) killed affected plants and caused mod. damage in a variety plot at Saskatoon, Sask. (H.W.M.).

LEAF SPOT (Leptosphaeria pratensis (Stagonospora meliloti). Sl.-mod. infections were common in Man. (W.C. McD.).

ROOT ROT (Plenodomus meliloti) occurred in 8/8 fields examined in central Alta. Ratings were 5-tr. 3-sl. (J.B. Lebeau).

COMMON LEAF SPOT (Pseudopeziza medicaginis). Sl.-mod. infections were observed in plots at Brandon and Winnipeg, Man., late in the summer. (W.C. McD.).

BASAL STEM ROT (Sclerotinia sclerotiorum) occurred mostly in n.-e. Sask.; Ratings were 2-sl. 8-mod. in 10/22 fields (H.W.M.).

WINTER CROWN ROT (low-temperature basidiomycete) caused sl. damage in 1 field near Edmonton / 8 examined in central Alta. (J.B. Lebeau).

MOSAIC (bean virus 2) occurred on Brandon Dwarf. Symptoms were observed on plants on roadsides s. of Brandon and e. to Glenboro, Man., but the disease was not observed in adjacent fields (W.C. McD.).

DECLINE (? virus) was noted from Kamouraska Co., Que. (R.O. Lachance).

BLACK LEAF BLIGHT (cause unknown). Several farmers in the Neepawa area reported a disease not previously encountered in Man. All the leaves and part of the petioles were black and completely shrivelled on plants in the bud stage. The diseased plants occurred sporadically among healthy plants. The stems and roots of affected plants appeared to be healthy. Isolations from leaves, petioles, stems and roots yielded only common saprophytes. All the leaves on all the branches of an affected plant were distorted as though acted upon by a toxic material. The sporadic occurrence of the disorder and the information that no spraying had been done within one mile of one of the fields ruled out herbicides as a cause. Nor did it appear that insects were directly responsible (W.C. McD.).

OIL-SEED CROPS

FLAX

Special reports of flax diseases were prepared for Sask. by T.C. Vanterpool and Man. by B. Peturson.

FLAX DISEASES IN SASKATCHEWAN IN 1956

Flax acreage and total yield in 1956 were the highest ever attained in the province. The average yield was 10.3 bu. per acre (18,000,000 bu. on 1,750,000 acres). This is about 2 bu. above the long-time average. The widely scattered, but slight, frost of 19 Aug., affected the seed quality

appreciably, as did the more severe frosts of 5, 6 and 7 Sept. The late seeding increased the chances of the crop being damaged from these frosts. The feeding of frozen immature flax to livestock has resulted in isolated cases of poisoning because of the hydrocyanic acid compounds produced as a result of certain breaking-down processes due to freezing.

May was dry; this resulted in uneven germination, the later plants emerging about 2 weeks after the first ones. In addition, Seedling Blight (Rhizoctonia solani) was conspicuous on the early seedlings, and Heat Canker caused by high temperatures and bright sunshine in early and middle June, further thinned the crop. Strong winds in several areas caused severe breaking-off of young plants partially damaged by heat canker earlier when in the seedling stage.

By the end of the third week of June, flax fields in general looked thin and uneven in height, and prospects for a good crop were not bright. Fortunately from then on the rainfall was distributed in numerous, relatively small, intermittent showers throughout June, July and early Aug., and the temperature remained below normal for the rest of the summer. These conditions favored growth and branching so that by flowering time flax fields generally showed good and moderately uniform stands, the late-sown fields being much the better.

Seedling Blight (Rhizoctonia solani). There were widely scattered mod. infections in many early-sown flax fields following fallow, but less on flax on cereal stubble fields. Seedling blight is rarely noticed by farmers, so that few enquiries are received and surveys are necessary to determine its extent.

Heat Canker. 1956 was a 'heat canker year' for flax. This can be accounted for by the high temperatures of early June; actually, the highest temperature of the summer, 97°F., occurred on 10 June. The high killing of seedlings in the early sown fields was caused by (1) Rhizoctonia blight and (2) heat canker, both troubles being favored by relatively dry soil and high temperatures. One to three weeks later, however, plants partially damaged at ground level by heat canker were broken off by strong winds and became quite conspicuous. This late type resulted in 10 enquiries from farmers, which is large when the short duration of the trouble is taken into account. Heat canker was more sev. on flax on fallow and definitely less on flax on cereal stubble where the trash helped to shade the soil near the seedlings. Chlorotic banding of cereals, which may also be caused by high soil-surface temperatures was more prevalent than normal.

Rust (Melampsora lini). Virtually absent except for reports of infections on Redwing around Prince Albert. Tr. or absent in central and s. Sask.

Wilt (Fusarium oxysporum f. lini). A few isolates were obtained from 1 sample sent in.

Rust and Wilt which were for many years the most important diseases of flax in Sask. are being adequately controlled at the present time by resistant varieties.

Pasmo (Septoria linicola) continues to spread westward though the affected fields may be widely scattered. Reports from agricultural workers in Assiniboia, Moose Jaw and Swift Current indicate that pasmo was common in those districts. Moderate infection on the Regina plains with sl. to mod. through the Weyburn district and eastward. In the area n. of the Qu' Appelle to Saskatoon pasmo was rarely found. Slight to moderate infections were found in the n.-e. which was formerly the stronghold of browning and stem-break. Pasmo is definitely a disease of maturing plants. This was strikingly brought out in a field 20 miles s.-w. of Regina in which the older, earlier emerged plants showed slight to moderate pasmo, while the younger, late emerged plants showed none to tr. (28 Aug.). The moist conditions of the last 3 years appear to have favored its westward and northwestward spread in Sask. No varietal differences in resistance could be discerned in plots at the Swift Current station.

Browning and Stem-Break (Polyspora lini). None was observed this year in the field. It is difficult to explain the decline in this disease which used to be serious on flax in the n. and n.-e. of the province, where seed with a 20 - 35% infection was often found.

Blight (Alternaria linicola). Conspicuous only in e.-central and s.-e. Sask. around Grenfell, Kennedy, Melville, Fort Qu' Appelle, Dysart, Cupar, Markinch, Halfield and Venn. It appeared as long, dirty, black lesions with smudged indefinite edges, or the whole top third of the plant may be brownish black. Alternaria linicola, A. tenuis type, and Fusarium spp. (not F. oxysporum f. lini) were isolated in that order of frequency.

Yellows (aster yellows virus). Absent or tr. only in most fields. In one field at Kisby there was 5 - 10% yellows at the edge of a late-sown field, with only a tr. further in. At Arcola there was mod. yellows in a weedy spot in one field. The gray leafhopper, the yellows vector, was less plentiful than in the last 3 years during which yellows was conspicuous. The leafhopper population was slow in building up compared with these years (based on information from entomologists).

Herbicide Damage and Thrip Injury. Boll fusion, or clumping of bolls, was conspicuous in the plots and in an occasional field. Thrips were always present in the clumps, but as there was usually other evidence of herbicidal injury in affected fields, it is thought that the thrips aggravated a trouble initially caused by herbicide. The symptoms of herbicidal damage on flax are constantly changing. This appears to be due to new herbicides and to different

formulations, as well as to the stage of development of the plant at which the herbicide is applied. Herbicidal damage to flax appears to have been worse than usual, probably the result of late application. Flax is not ordinarily sprayed until after the cereal spraying is complete. Delay in cereal seeding necessitated a delay in spraying generally. This was what happened in 2 cases of damage to flax near Regina where the herbicide was applied from an airplane on 12 July when the crops were too far advanced.

Lime-Induced Chlorosis was conspicuous in the corner of one field near Cudworth. It appears to be most common on semi-degraded soils.

Apical Injury. A type of apical injury involving death of the growing point followed by stimulation of side branches near the top, was observed for the first time. It occurred on plants approaching the flowering stage. Its cause is unknown.

FLAX DISEASES IN MANITOBA IN 1956

Weather conditions were favorable for growth of flax throughout Man. in 1956. The crop was not affected by disease to any marked extent and good flax yields were obtained in all crop districts. There were 808,000 acres sown to flax. The estimated yield was 10.4 bu. per acre, 1.4 bu. per acre higher than last year.

Rust (Melampsora lini). About 92% of the flax acreage in Man. was sown to rust resistant varieties. Practically no rust occurred on the rust resistant varieties anywhere in the province. A light rust infection was present on Bison and Dakota in experimental plots at Morden and Brandon and a light infection was observed in a few fields of Red Wing.

Pasmo (Septoria linicola). Pasmo was present in most fields but generally was very light and in many of the fields examined it occurred in tr. amounts only. However, a few fields which carried heavy infections were observed.

Yellows (aster yellows virus). Aster yellows was much less prevalent, in 1956, than in the 3 previous years. Many of the fields examined were free of aster yellows and where found it was present in tr. amounts only. The gray leafhopper, the vector of aster yellows, was very much less prevalent than during the period 1953-55 when this disease was common in flax.

Other Observations

WILT (Fusarium lini) was noted on irrigated crops at Vauxhall, Alta. (A.W. Henry)

RUST (Melampsora lini) affected 40/65 fields examined in central and n. Alta. Most of the rust was found in the Peace River district. Flax is a profitable crop but early-maturing varieties suitable for the district lack rust resistance. The acreage is extensive and flax is grown on the same or adjacent fields year after year. Consequently rust causes sev. losses (W.P.C.). Sl.-sev. infections were noted at Edmonton, Fayban, and Fairview, Alta. (A.W. Henry). Only 4/28 fields examined in s. Alta. were affected. Ratings were 2-tr. 1-sl. 1-sev. Bison was sev. damaged in irrigated plots at Lethbridge; Redwing was sl.-mod. infected and all other varieties and lines tested were not infected (J.S. Horricks).

BROWNING and STEM STREAK (Polyspora lini). Tr. infections occurred in 2 fields in the Peace River district /65 examined in central and n. Alta. (W.P.C.). At Berwyn 20% of plants in a 150 acre field were broken over (A.W. Henry).

ROOT ROT (Rhizoctonia solani) affected 6/28 fields in s. Alta. Ratings were 3-tr. 3-sl. (J.S.H.).

PASMO (Septoria linicola) affected 2 fields slightly in central Alta. /65 examined in central and n. Alta. (W.P.C.).

PREMATURE RIPENING (cause unknown) with consequent loss in yield occurred in patches in several fields near Brooks and Lethbridge, Alta. It was observed most frequently in spots where soil conditions appeared to be unfavorable. Rhizoctonia root rot was associated with the damage in some fields but not in others (E.J. Hawn, M.W. Cormack).

FIBRE FLAX

WILT (Fusarium oxysporum f. lini). A sev. outbreak was observed in Berthier and Soulanges Counties, Que., where a new, highly susceptible variety, Wiera, was introduced. Several fields were complete losses (R.O. Lachance, D. Leblond).

RUST (Melampsora lini) sev. affected 1 field of Liral Dominion in Soulanges Co. Fifty fields were surveyed in Soulanges and Berthier Counties of Que. (R.O. Lachance).

PEPPERMINT

RUST (Puccinia menthae) caused 100 percent infection of a row of plants at Experimental Station, Kentville, N.S. Spores were being discharged from aecia on swellings of the stems at ground level, on 13 June. Ten percent of the plants were girdled (K.A. Harrison).

RAPESEED

A Special Report "Rapeseed diseases in Saskatchewan in 1956" was prepared by T.C. Vanterpool.

RAPESEED DISEASES IN SASKATCHEWAN IN 1956

Rapeseed acreage for 1956 was 300,000; more than double that of 1955. With this increase in acreage from a low of 1,400 acres in 1950, there has been a general, concomitant increase in severity of the diseases affecting the crop. Particularly in areas where there is a concentration of acreage, such as around Prince Albert and Shellbrook, farmers have learned from experience the value of crop rotation in limiting losses from Sclerotinia Stem Rot. Downy Mildew (Peronospora parasitica) which was first observed in 1952 is definitely on the increase (P.D.S. 32:34).

Stem Rot (Sclerotinia sclerotiorum) was absent to a tr. in most fields encountered on survey in central Sask., but it should be realized that many farmers were growing rapeseed for the first time. One field 6 mi. n. of Melville had 3-5% stem rot. This amount of stem rot tended to increase lodging, under the moist conditions prevailing, by bringing down healthy plants with diseased plants. The rape followed a ceral crop on fallow; it seems likely, therefore, that sclerotia were sown with the seed. In the Prince Albert area, one of the oldest rapeseed growing areas in the province, Mr. M. MacKay, the Agricultural Representative, reports that many Polish rape fields had large patches affected by stem rot that ripened prematurely with very little seed in them. He states that this condition was most common where the farmers had been growing rape for a few years.

Downy Mildew (Peronospora parasitica). At the present time severe outbreaks of this disease are confined to certain localities. Little or none was found in the Saskatoon area, but n. of Humboldt to Lake Lenore there were sl. to occasionally sev. infections. At Maryburg there was a field with 15% infection. The Agricultural Representative at Prince Albert reports that this year "downy mildew could be found in practically every field" and that "many of them would average around 5%".

Stem and Pod Black Spot (Alternaria brassicae) was more common this year than ever. It is the only seed-borne parasite of rape which I have isolated consistently from seed. That 1956 rape seed from Sask. will be highly infected with A. brassicae is indicated by preliminary isolation, seed treatment may be necessary.

Fusarium Stem Rot (Fusarium sp.). On 20 Aug. a few plants, which were drooping and ripening prematurely, in plots at Saskatoon were found to be attacked by Fusarium at ground level. There was slight pink discoloration of tissue, and spore masses were present. Isolations from internal portions of the roots and crown yielded Fusarium and a few cultures of Pythium debaryanum. In laboratory inoculations the Fusarium was only moderately pathogenic to rape. Pythium produced the usual damping-off.

Seedling Blight (Rhizoctonia solani). Some damping-off of rapeseed occurred in the greenhouse in fresh potting soil. Two strains of R. solani were isolated which were highly pathogenic. These findings suggest that Rhizoctonia seedling blight in the field has hitherto passed unobserved.

Yellows (aster yellows virus). A tr. was found in two fields only. The late-season flare-up on side branches of rape was not observed this year.

White Rust (Cystopus candidus). Traces only found on occasional plants attacked by downy mildew.

Other Observations

GRAY LEAF SPOT (Alternaria brassicae) caused sl. damage in 15/20 fields surveyed in Sask. It caused bleaching of stems and pods and shrivelling of seeds (H.W. Mead).

Heavy infections were noted from Balmoral and Hamiota, Man. and sl. infection in plots at Fort Garry. The characteristic long conidia of A. brassicae were obtained from leaf scrapings and from isolations (W.C. McDonald).

DOWNY MILDEW (Peronospora parasitica) was found on sl. damaged specimens from nr. Prince Albert, Sask. (H.W. Mead).

STEM ROT (Sclerotinia sclerotiorum) caused sev. damage in a 15-acre field nr. Colinton, Alta. Fifty to 75% of the crop was damaged and both yield and quality were affected (A.W. Henry). A survey of 20 fields in Sask. revealed 3-sl. and 10-mod. infections. Samples of this disease were received from Nipawin and Tisdale in n.-e. Sask. (H.W. Mead).

SAFFLOWER

LEAF SPOT (Alternaria carthami). In Late Sept. tr. infection was noted in plots at Lethbridge, Alta. (F. R. Harper).

RUST (Puccinia carthami) was sl.-mod. in irrigated plots grown from untreated seed at Lethbridge, Alta. (M. W. Cormack).

DAMPING-OFF (Pythium debaryanum, Fusarium sp.). About 10% of a 100-acre plot was destroyed and had to be resown. The second sowing did not blight off. Later, the disease was scattered throughout the whole plot. Occasional plants developed Fusarium root rot. Early isolations yielded Pythium predominantly with some Fusarium while later isolations were predominantly Fusarium. Both were severely pathogenic in artificial inoculations (T. C. Vanterpool).

SOYBEAN

A special report on "Diseases of Soybeans in Ontario in 1956" was prepared by A. A. Hildebrand for the Canadian Plant Disease Survey.

DISEASES OF SOYBEANS IN ONTARIO IN 1956

A discussion of the diseases occurring on soybeans in s.-w. Ont. in 1956 necessitates at the outset a consideration of the weather that prevailed in the area during the growing season. With the exception of July the summer was unusually wet. In the accompanying table a comparison is made between the average precipitation for April, May, June, July, and Aug., 1956, and that for the same months during the 25-year period, 1930-1955, and the 38-year period, 1917-1955.

Average Monthly Precipitation (in.)

Period	Apr.	May	June	3-month total	July	Aug.	5-month total
1956	3.30	4.54	4.13	11.97	1.74	5.67	19.38
1930-1955	2.47	2.55	2.95	7.97	2.25	2.35	12.57
1917-1955	2.65	2.40	2.95	8.00	2.10	2.30	12.40

From the table it may be noted that in April, May, and June, 1956, about 12 inches of rain fell in the Harrow area. Precipitation was as high, and often higher, in other parts of Essex and of Kent Counties. This meant that when

soybeans should have been planted, soils were extensively water-logged, and flooding of fields was frequent. According to official reports, by mid-June only 25% of the anticipated soybean acreage had been planted. Much of the earlier acreage was subjected to flooding for varying periods of time.

Also, during and after the period when soybeans are usually planted (about 20 May until 15 June), temperatures in 1956 were unfavorable for a warmth-requiring crop. Below, a comparison is made between the average weekly temperatures from 15 May-11 June, 1956, and those for the corresponding weeks during the 6-year period, 1949-1955.

Average Weekly Temperatures (°F.)

Period	15-21 May	22-28 May	29 May - June 4	5-11 June
1949-1955	60.0	60.3	64.5	67.5
1956	50.8	56.5	58.5	65.7
Difference	9.2	3.8	6.0	1.8

Such, then, in general, were the environmental conditions under which most soybeans got away to an unusually inauspicious start in s.w. Ont. in 1956.

Phytophthora Root and Stalk Rot (Phytophthora sp.). Two years ago, (P.D.S. 34:46), reference was made to a new disease of undetermined cause which was widespread throughout the soybean-growing area of w. and s.w. Ont. The disease was widely prevalent again in 1956, and more threatening than it had been in 1954. (The disease was present in 1955 but the writer was in Britain for most of the summer and had no opportunity of making any observations). On 4 July, 1956, attention was called to a 75-acre field of Harosoy soybeans in 30 acres of which most of the young plants were either dead or dying. The field had been flooded, and popular opinion held that the plants in this and other flooded stands had been killed or injured by "water damage". Wilting plants, all showing a depleted, necrotic root system and a characteristic, grayish-green or tan-coloured lesion extending upwards on the stem, were obtained. From them a Phytophthora was isolated consistently. During the first 3 weeks in July many fields over a wide area including Pelee Island were visited and the disease was observed in varying intensity on plants in various stages of development. In many fields only a few plants in small patches were affected; in others, loss of plants was sev. in areas up to 2 acres in extent. Often, but certainly not invariably, the disease was worst in low spots in a field, or in fields that had been flooded. When groups of plants were involved, spread of the disease tended to be along rather than across the rows. Most serious losses occurred in fields in which the disease was attacking nearly full-grown plants in the early podding stage. From late July, until the end of the season, infection of plants was reduced sharply, although dying, fully-podded plants were not difficult to find in Sept. Whether the reduction in infection in July was correlated with or merely incidental to the low rainfall for that month (only 1.74 in.) is not known.

From early July until mid-Sept., isolations from diseased specimens, selected in widely different areas, yielded cultures of a Phytophthora. Eleven representative isolates have been compared in culture on various artificial media, and they all appear to be the same. Moreover, they act similarly pathogenically. In greenhouse and in field infection tests these 11 isolates have been found to be highly pathogenic to soybeans of the varieties Harosoy, Lincoln, and Harman, their virulence being such as to kill Harosoy and Lincoln in a few days, and Harman in a slightly longer time. They infected Blackhawk slightly but Monroe remained immune from their attack. These results are closely in accord with those obtained in similar tests by investigators in Ohio and Illinois where the disease is also present. One isolate selected at random has been found to be pathogenic to Sanilac field and Black Valentine garden beans but innocuous to certain varieties of tobacco, cowpea, cucumber, and pepper.

No concerted effort has been made yet to identify the Ontario pathogen. Currently, it is being compared morphologically and pathologically with isolates obtained from Ohio and Illinois. The soybean pathogen in Ohio has been named Phytophthora cactorum; the Illinois fungus is still being referred to as Phytophthora sp.

A most unfortunate circumstance in regard to this disease is the almost complete susceptibility of Harosoy, a variety so promising in other respects that it is being adopted almost to the exclusion of other varieties.

Brown Stem Rot (Cephalosporium gregatum). It has been reported (Chamberlain, D.W., and W.B. Allington, Phytopath. 38:4. 1948) that low air temperature is the important factor in the development of brown stem rot. In the soybean-growing area of Ont. the summer of 1956 was appreciably cooler than usual. In the accompanying table a comparison is made on the basis of average weekly temperatures between a 6-week period in 1956 and a corresponding period for the previous six years.

Average Weekly Temperatures

Period	26 July-2 Aug.	3 - 9 Aug.	10-16 Aug.	17-23 Aug.	24-30 Aug.	31 Aug.-6 Sep.
1949-1955	74.0	73.6	73.6	75.6	75.5	73.2
1956	70.0	69.8	69.7	69.4	72.3	69.7
Difference	4.0	3.8	3.9	6.2	3.2	3.5

Whether the lower temperatures indicated above for the summer of 1956 were a predisposing factor is not known but certainly the disease appeared earlier and in more serious proportions than for a number of years previously. By 15 Aug. a field of Harosoy was observed in which about 2 acres were seriously affected by the disease. As the season advanced the disease was observed in an increasing number of fields regardless of variety. Observations in 1956, as in previous years, indicate that brown stem rot must be responsible for an appreciable reduction in the yield of soybeans in Ontario.

In 1952, the laboratory experimental plots in which soybeans had been grown successively for 3 years had to be relocated because of the severity of brown stem rot. In the new site the disease made its appearance in 1954, increased in 1955, and this year became a factor of such importance that the plots will again have to be abandoned. These circumstances furnish convincing evidence not only of the rapidity with which this disease can spread once a soil has become infested, but also of the inadvisability of growing soybeans after soybeans in the same location.

Rhizoctonia Root and Stem Rot (Rhizoctonia solani). Only once previously in these reports (P.D.S. 30:40) has R. solani been mentioned as a pathogen of soybeans. At the time it was reported that the fungus had completely destroyed a late-planted field of Lincoln soybeans under conditions of excessive temperature and moisture. This year, early in July, the fungus was found attacking plants in 11 different fields. Affected plants, moreover, showed a necrotic and depleted root system, and on the lower stem regions were numerous, reddish-brown lesions, not continuous and elongated like those caused by Phytophthora, but smaller and tending to be disposed irregularly. It was evident that the disease had been killing plants for some time before it first came under the observation of the writer. Incidence of the disease could not be associated with any recognizable topographical feature common to all fields. In the aggregate loss of yield was not high but foliar discoloration and mortality of plants were so conspicuous as to alarm the growers whose fields were affected.

Stem Canker (Diaporthe phaseolorum var. caulivora), which a few years ago constituted the most serious threat to soybeans in s.w. Ont. was almost innocuous in 1956. In early August, as usual, the disease had affected spurs and petioles on the lower half of stems of susceptible varieties. However, in only a few instances did infection advance into the main stem. In commercial stands, stem-canker infected plants did not attract attention until about 7 Sept. A reason for the low incidence of the disease is the widespread adoption of Harosoy which is an "escape" variety. Stands of susceptible varieties such as Hawkeye and Blackhawk are rare, and only small acreages are planted to the formerly popular but susceptible variety Lincoln.

Manganese Deficiency. Usually an appraisal of the extent and the effect of manganese deficiency can be made about 15 June. This year, however, because of delayed planting, such an appraisal could not be made until early in July. Despite an abundance of moisture in the soil, the deficiency was as widespread as usual and its effects even more sev. than in previous years. This deficiency, more correctly a non-availability, of manganese is, in the opinion of the writer, one of the most important factors that modify the yield of soybeans in much of Essex and in parts of Kent County.

Nematodes. In cooperation with Dr. W.B. Mountain, Nematologist, at the Harrow laboratory, soil and root samples were collected from 52 soybean fields in Essex and Kent counties and on Pelee Island. The soil samples represented 7 different types, the root samples several different varieties. At the time of sampling, information was taken regarding variety of soybean, crop sequence, and fertilizing practice. Soil and root samples were processed in accordance with accepted standard methods, and the nematodes encountered were studied in a preliminary way quantitatively and qualitatively. They were found to represent saprophytic, predatory, and parasitic or potentially parasitic groups. No clear-cut correlations could be made, however, between numbers or types of nematodes and soil type, variety of soybean, and crop sequence. This survey is believed to be the first of its kind to be carried out in Canada.

SUNFLOWER

STEM ROT (Sclerotinia sclerotiorum) caused tr.-sl. damage in plots at Saskatoon. One specimen was received from Ibstone, Sask. (T.C. Vanterpool). Wilt symptoms attributed to S. sclerotiorum were observed in most fields in central Man. Several fields had infections of 10% (J.W. Martens).

DOWNY MILDEW (Plasmopara halstedii) was present in most Man. fields in tr. amounts. The most severe infection was 2 or 3% (J.W.M.).

RUST (Puccinia helianthi) occurred in tr.-sl. amounts in most fields in the central Man. (Altona-Winkler) area late in the season. No rust was found on Beacon growing just outside the central area. Several fields of Advance had mod. infection and 1 field of Mennonite was heavily infected. Tr. infection occurred on an isolated field of Advance nr. Carman.

No information on the races of sunflower rust present in Man. was available for 1956 (J.W.M.).

LEAF MOTTLE (Verticillium albo-atrum) was prevalent again this year. Infections ranged from tr.-50-60% in some fields. The sev. affected fields invariably had been planted to sunflowers within the previous 4 years. Sunflowers in a plot that had been seeded to the same crop for 3 consecutive years developed the condition in 95% of the plants (J.W.M.). See also New and Noteworthy Diseases.

YELLOWS (Aster yellows virus) was observed in only a few cases and then in tr. amounts. Sunflowers failed to develop symptoms even when planted on an area where the disease had been found previously (J.W.M.).

Hail caused considerable damage in July. 2,4-D drifted into some fields and did appreciable damage to a number of fields (J.W.M.).

ROOT CROPS

MANGEL

BROWN HEART (boron deficiency) was found in samples brought in by 2 growers from Sooke B.C. (W.R. Foster).

SUGAR BEET

DODDER (Cuscuta sp.). An infestation that evidently had spread from a single parasitized beet planted 2 or 3 years previously now was fairly prevalent on seedlings in a field at Tempest, Alta. (M.W. Cormack).

BLACK ROOT (various fungi) was found in all 42 fields examined in s. Alta. An av. of 57% of the seedlings were infected and 7% were sev. damaged or killed. Rhizoctonia solani was found in 55% of the fields, Pythium spp. in 38%, Phoma betae in 24% and Aphanomyces cochlioides in 10%. One late-seeded field was sev. damaged by the 4-leaf stage and was ploughed under in September (F.R. Harper).

DAMPING-OFF (Rhizoctonia solani) was observed in several fields at St. Hyacinthe, St. Thomas-d'Aquin, and St. Hilarie, Que. In some fields 20% of plants were affected; most fields had 5-10% infection. After thinning the same fields had root rot caused by the same organism on about 1% of plants (R. Crete).

MISCELLANEOUS CROPS

FIELD CORN

A special report was prepared by N.J. Whitney to record the results of a survey for ear and stalk rots of field corn in Essex, Kent, and Lambton Counties in s.-w. Ont. Fifty consecutive plants were rated in two different locations within each of the 25 fields surveyed.

Pink Ear Rot (Fusarium moniliforme) was present in 15 fields and ranged from 1 - 4%, av. 1.6%. Gibberella Ear Rot (Gibberella zeae) was present in 18 fields and ranged from 1 - 7%, av. 1.9%. Diplodia Ear Rot (Diplodia maydis) was present in 6 fields and ranged from 1 - 9%, av. 0.4%. It was present chiefly in Lambton Co.; none was found in Essex. The ear rots caused only sl.-mod. damage and would not reduce yield to any extent.

Stalk and Root Rot (Fusarium spp., Pythium spp.) was found in all 25 fields and ranged from 4-70%, av. 33.4%. It was more common in Kent and Essex Counties than in Lambton Co., where the crop was later. Damage caused by stalk rot was mod.-sev. Yield would be reduced because of difficulty in harvesting ears from lodged plants.

Other Observations

CORN SMUT (Ustilago maydis) was noted from Moose Jaw, and Davidson, Sask. (T.C. Vanterpool). Smut affected 6/25 fields surveyed in Essex, Kent, and Lambton Counties, Ont. Infections ranged from 1-3%, av. 0.3% (N.J. Whitney). Tr. amounts were observed at Montreal Botanical Garden, Que. (P. Duval).

BRITTLENECK (2,4-D injury). About 12 acres in Queen's Co., P.E.I., showed wind and cultivator damage, after 2,4-D had been applied. Abnormal growth of brace roots occurred but total damage was sl. (J.E. Campbell).

HOP

DOWNY MILDEW (Pseudoperonospora humuli) was found in sl. amounts in the Sardis district, B.C. Zineb is being used as a fungicide against the disease (W.R. Foster).

BLACK ROT (Pythium ? ultimum) affected 50% of plants at one farm in Lillooet Township, B.C. (G.E. Woolliams).

WINTER INJURY. Temperatures below 0°F. in mid Nov., 1955, killed nearly all plants in commercial plantings near Kamloops, B.C. The farms had to be replanted (G.E. Woolliams).

MUSTARD

WHITE RUST (Albugo candida) affected 4/8 fields in s. Alta.; ratings were 2-tr. 2-sl. (J.S. Horricks). Mod. infection was noted at Botanical Gardens, Montreal, Que. (P. Duval).

ROOT ROT (Rhizoctonia solani) caused tr. damage in 1/8 fields surveyed in s. Alta. (J.S.H.).

E. CULTIVATED AND OTHER GRASSES

AGROPYRON

Ergot (Claviceps purpurea) was found on A. inerme nr. Fort Vermilion, Alta; on A. repens at 3 places in central Alta.; on A. smithii nr. Cecil Lake, B.C.; on A. spicatum at Worsley, Alta.; on A. subsecundum at 2 places nr. Fort Vermilion (W.P. Campbell).

Stem Smut (Ustilago hypodytis) occurred in one section of the Trout Creek District. The disease seems to have started in a local field and is steadily spreading to nearby fields nr. Summerland, B.C. (G.E. Woolliams).

AVENA FATUA

Stem Rust (Puccinia graminis) was found commonly on wild oats throughout central Alta. (W.P.C.).

Stripe Blight (Pseudomonas striafaciens) was found in tr. amounts nr. Morrin, Alta. (W.P.C.).

BROMUS

Ergot (Claviceps purpurea) was noted on B. inermis at 21 locations in n. and central Alta. (W.P.C.). In Sask. 10/15 fields were affected; ratings were 2-sl. 8-mod. It was also present on brome grass planted on roadsides to control weeds (H.W. Mead).

Leaf Blotch (Helminthosporium bromi) caused sl. damage on Bromus spp. in plots at Saskatoon and on roadsides in Sask. (H.W.M.). Also present at Guelph, Ont. (L.V. Busch).

Leaf Spot (Helminthosporium sorokinianum) caused sev. damage in College plots at Guelph, Ont. In many cases the lower leaves were completely killed. The total reduction of leaf surface approached 50% in many plots. H. bromi was also present but to a lesser degree. Both organisms would be found on the same plants and could not be distinguished on symptoms alone (L.V.B.).

Scald (Rhynchosporium secalis) was collected on B. inermis nr. Duhamel, Alta. (W.P.C.). Scald was less sev. than usual at Guelph, Ont. (L.V.B.).

Leaf Spot (Selenophoma bromigena) was mod.-sev. on roadside stands at Pincher Creek, and Cowley, Alta. (E.J. Hawn). Sl.-mod. infections were found in 10/15 fields examined in Sask. and on roadside plants (H.W.M.).

CALAMAGROSTIS

Ergot (Claviceps purpurea) was found at Ft. Vermilion and Legal on C. canadensis and at Ft. Vermilion and Dewberry, Alta. on C. inexpansa (W.P.C.).

Tar Spot (Phyllachora graminis) occurred in mod. amounts on C. canadensis at St. Roch des Aulnaies, Que. (D. Leblond).

DACTYLIS GLOMERATA

Ergot (Claviceps purpurea) was present in mod. amounts at St. Clement, Que. (D. Leblond).

Stem Rust (Puccinia graminis var. phlei-pratensis) occurred in tr.-sl. amounts in plots at Lethbridge, Alta. (E. J. Hawn).

Leaf Scald (Rhynchosporium sp.) together with brown stripe caused by Scolecotrichum graminis usually affects orchard grass severely at Guelph, Ont. Frequently all the leaves are killed by these two pathogens. However, damage was much less this season (L. V. Busch).

Brown Stripe (Scolecotrichum graminis) was present in tr.-sl. amounts in plots at Saanichton, and at Sardis, Chilliwack, Whiskey Creek and Soda Creek, B.C. (E. J. Hawn, W. R. Foster). It occurred in sl.-mod. amounts in pasture plots at Lethbridge, Alta. (E. J. Hawn).

Stagonospora Leaf Spot (Stagonospora arenaria) caused sl. damage at St. Clement, Que. (D. Leblond).

Leaf Rust (Uromyces dactylidis) was present in mod. amounts at St. Clement, Que. (D. Leblond).

ELYMUS

Ergot (Claviceps purpurea) was collected at 7 stations in the Peace River area of Alta. on E. innovatus (W.P.C.).

Brown Stripe (Scolecotrichum graminis) was found in sl.-mod. amounts on E. canadensis near Scandia, Alta. on 14 Aug., 1956. Apparently this is the first report of the disease in the area (E. J. Hawn). The fungus comes within the limits of S. graminis on various grasses, but is unusual in having sl. roughened spores. It matched in this respect one collection on Poa compressa. There may be several varieties of this organism (D. B. O. Savile).

FESTUCA

Ergot (Claviceps purpurea) was found nr. Gordondale and Legal, Alta. on F. rubra (W.P.C.).

Net Blotch (Helminthosporium dictyoides). Light infection was observed in a field of Sturdy meadow fescue grown for seed at Fort Garry, Man. (W.C. McDonald).

Winter Crown Rot (low-temperature basidiomycete) was found in mod. amounts in 2 fields examined nr. Edmonton (J.B. Lebeau).

HORDEUM JUBATUM

Dwarf Leaf Rust (Puccinia hordei) was observed at several locations in central Alta. (W.P.C.).

Scald (Rhynchosporium secalis) was collected at 11 stations in n. and central Alta. (W.P.C.).

Leaf Speckle (Selenophoma sp.) was collected nr. Beaverlodge, Alta. (W.P.C.).

Head Smut (Ustilago bullata) was seen at several locations in central Alta. (W.P.C.).

PHLEUM PRATENSE

Ergot (Claviceps purpurea) was found nr. Legal, Alta. (W.P.C.). A few affected plants were seen at St. Gregoire, Que. (R. Crete).

Stem Rust (Puccinia graminis var. phlei-pratensis) was mod.-sev. at the Exp. Farm, Lethbridge, Alta. (E. J. Hawn).

Winter Crown Rot (low-temperature basidiomycete) caused sl. damage in a field nr. Edmonton, Alta. (J.B. Lebeau).

POA SPP

Winter Crown Rot (low-temperature basidiomycete) caused sev. damage in both stands of P. annua examined nr. Edmonton, Alta. (J.B. Lebeau). Four stands were sev. and 1 was sl. damaged out of 5 stands of P. pratensis examined nr. Edmonton, Alta. (J.B.L.). Several circular patches of dead grass occurred in University lawns at Fort Garry. Cultures typical of the basidiomycete were obtained. These are the first isolations of this fungus from grass in Man. (W.C. McDonald).

SETARIA ITALICA

Gray Leaf Spot (Piricularia grisea). A specimen was received from St. George, Ont., where the disease caused mod.-sev. damage in a 10-acre field (L.V. Busch).

SORGHUM VULGARE

Bacterial Leaf Spot (Pseudomonas syringae). Five varieties of sorghum; technicum, caffrorum, saccharatum, sudanense, and durra were grown in the Montreal Botanical Garden. All 5 varieties were badly spotted by this bacterial disease (E. Jacques).

TURF

Damping-off (Pythium arrhenomanes) sev. damaged a new lawn started in poor soil at Kindersley, Sask. P. arrhenomanes was isolated from the sample (T.C. Vanterpool).

Grass affected by the alga Symploca muscorum was sent by W.R. Foster from a bowling green in Victoria, B.C. S. muscorum had previously been reported as causing blackening of a lawn in B.C. (P.D.S. 34:54) (I.L.C.).

III. DISEASES OF VEGETABLES AND FIELD CROPS

ASPARAGUS

CROWN AND ROOT ROT (Fusarium sp.) was reported causing sev. damage in a 5-acre planting of Viking (V 35) near Port Hope, Ont. Many crowns were completely dead and others appeared to be dying rapidly. The planting was in a high, well drained field on sandy loam over clay; part was planted in 1953 and part in 1954 with plants grown at St. Catharines. The disease was first noted this year. (C.B. Kelly).

FROST INJURY. All of the first cutting and 60% of the second were lost from being frozen off in the Toronto-Hamilton area, Ont., this spring. (W.S. Carpenter).

BEAN

Dr. R. L. Millar has prepared a special report on the bean diseases in s.w. Ontario. The survey in August was to determine the incidence of Anthracnose and secure material for physiologic form studies.

It is estimated that 6000-7000 growers had 60,000-70,000 acres under cultivation to dry beans in 1956. The Ontario Bean Growers' Marketing Board, London, Ont., is concerned with the marketing of only the white, Yellow Eye and Red Kidney varieties. Practically the entire production of these varieties is handled by the Board. Other bean varieties are mostly grown under contract with various commercial canners.

The areas of production for the different varieties are as follows: white beans in Huron, Lambton, Middlesex, Elgin, Kent and Essex counties; Red Kidney about Alvinston (Lambton) and Ridgetown (Elgin); and Yellow Eye about St. Thomas (Elgin). The center for the entire area under cultivation to beans is considered to be Strathroy in Middlesex County.

Source of seed for these fields is as follows: white beans, Michigan; Red Kidney, California; and Yellow Eye, no definite information obtained.

In Huron and Middlesex counties, Anthracnose was found in about half the fields of white beans examined. Infection ranged from tr. to sev. and in 75% of the infected fields it was sl. to mod. Collections of anthracnose were obtained from fields of the varieties Clipper, Michelite and Robust. Anthracnose was not observed on white beans examined in the other 4 counties; the reason for this distribution of the disease is not clear.

Anthracnose was present in about 80% of the fields of Yellow Eye examined; infection ranged from sl. to sev. The variety Red Kidney appeared to be free of disease in both areas in which it is grown.

The Bacterial Blights were present throughout the bean growing area; infection was tr. to sev. on white beans. They were slightly more prevalent in Elgin and Kent than in Huron and Middlesex counties. In the Chatham-Ridgetown area, their incidence was sufficiently high to cause considerable concern of the growers who feared their further development if conditions were favorable. Yellow Eye also showed a high incidence of bacterial blight in a few fields whereas these diseases were present in only tr. amounts in Red Kidney.

Mosaic was somewhat more prevalent than expected in white bean fields. While records were not kept for this disease, its prevalence, particularly in Elgin and Kent counties, suggests that it be given more attention in the future. In one field of Robust every plant was infected.

Rust and Sclerotinia Rot occurred in tr. amounts. The incidence of Root Rot appeared to be rather high although environmental conditions that prevailed this year favored good plant growth and tended to reduce above-ground symptoms.

In an area around Port Hope several fields of different snap bean varieties were examined. These beans were being grown for seed under contract in about 70 fields ranging from 2 to 35 acres in extent. The seed is obtained from Idaho and is increased in Ontario over a 3-year period. Anthracnose, bacterial blight and mosaic were found in varying degrees of severity. Anthracnose was present in King Orange, Landless New Stringless and Canadian Wonder whereas Top Knotch, Golden Wax, Pencil Pod Black Wax, Tenderbest and Dwarf Horticultural were free of disease.

Dr. R.N. Wensley has provided some observations on diseases of white beans in southwestern Ont., which supplement those of Dr. Millar.

Root Rot (Fusarium solani f. phaseoli and F. oxysporum) was prevalent in most fields visited in s.w. Ont. It was most severe in areas where flooding caused by heavy storms and low temperatures resulted in conditions unfavorable for plant growth. While F. oxysporum was associated with root rot in some fields, F. solani f. phaseoli was most prevalent and was the main cause of root rot where soil moisture was in excess. In 1955 when drought conditions prevailed, F. oxysporum was isolated to the exclusion of F. solani f. phaseoli from plants affected with root rot.

Common Blight (Xanthomonas phaseoli) was unusually scarce in s.w. Ont. A sl. infection was present in many fields but the disease spread under the prevailing weather conditions.

Sclerotinia Wilt (S. sclerotiorum) was found in a shaded area of one field. Cool wet weather combined with heavy growth and poor air circulation caused heavy infection.

Other Observations

GRAY MOLD (Botrytis cinerea). A sl. infection was observed on the lower leaves of pole beans received from 2 growers in the Lower Fraser Valley, B.C. This disease was reported in 1955 (P.D.S. 35:53), but it occurred only on mature pods in a few fields after a rainy period and actually caused little loss (H.N.W. Toms).

ANTHRACNOSE (Colletotrichum lindemuthianum) was more severe than usual in snap bean plantings in the Niagara Peninsula, Ont. (J.K. Richardson). A mod. infection was noted in a 5-acre field of Brittle Wax grown for seed at Standbridge East, Que. (E. Lavallee). Infection was sl. in a small field at St. Jean (R. Crete), sl.-mod. at Ste. Foy and sev. at St. Roch des Aulnaies (D. Leblond). Anthracnose caused up to 35% loss of crop in a field at Gagetown, N.B. (S.R. Colpitts). Several young plants were found sev. infected in a garden in King's Co., N.S., in July; the disease increased in the district and by fall, it caused 20% loss in one 3-acre field of dry beans (K.A. Harrison). Plants were 100% infected in a home garden at East Royalty, P.E.I. (J.E. Campbell). Anthracnose was tr.-mod. in 2 plots on the east coast of Nfld. and in 3 at Searston (G.C. Morgan).

HALO BLIGHT (Pseudomonas phaseolicola) was reported as follows: Mod.-sev. infection in 5/6 affected fields found in s. Alta. (M.W. Cormack); in variety trials, University of Alberta, Edmonton, infection ranged from none to very sev., no halo blight being recorded on Golden Wax, Golden Wax Dwarf and Topnotch Golden Wax, and a tr. on Seminole; also rather sev. and widespread in Edmonton City (L.E. Tyner, W.P. Campbell); although the summer was generally cool and moisture plentiful in the Hamilton-Toronto area, Ont., disease less evident than common blight (W.S. Carpenter); infection abundant on unharvested pods, but damage sl. in a planting of Brittle Wax at L'Islet, Que., because disease developed late (L.J. Coulombe); destroyed 75% of crop and 50% of plants failed to set seed in a planting of Pencil Pod at Gagetown, N.B. (S.R. Colpitts); string beans very poor crop in the Annapolis Valley, N.S. and halo blight the most prevalent disease. (K.A. Harrison).

STEM ROT (Rhizoctonia solani). During a cool, wet period in June, most bean (Blue Lake) crops were affected, some seriously, about Kelowna and Vernon, B.C. Although some plants showed signs of recovery, these plants will be late and loss will be substantial (J. King, G.E. Woolliams).

SCLEROTINIA ROT (S. sclerotiorum) caused sev. damage in a garden planting in Fort Garry, Man. (B. Peturson). In an experimental plot at York, P.E.I. Puregold was most sev. affected, with lighter infection on Pencil Pod and Topcrop. Lesions were present on stems, petioles, peduncles, leaves and pods (J.E. Campbell).

RUST (Uromyces appendiculatus) was present in all canning-contract growers' fields of Blue Lake strains in the Lower Fraser Valley from Abbotsford to Chilliwack, B.C., and although infection was sev., loss was very sl. Rust usually appears first in late Aug., but it was reported this year in late June. 0-I stages were first recorded on 28 June at Huntingdon, II on 17 July at Langley Prairie and III on 29 Aug. at Matsqui Prairie. Specimens sent for deposit in DAOM (H.N.W. Toms). A sl. infection noted on Pencil Pod beans at Gagetown, N.B. (S.R. Colpitts). A tr. of rust noted in one planting in Queen's Co., P.E.I. (R.R. Hurst).

COMMON BLIGHT (Xanthomonas phaseoli) was evident in most plantings in the Hamilton-Toronto area, Ont., and periodically caused serious spotting of the pods; lesions most evident on pods of yellow varieties such as Kinghorn (W.S. Carpenter). Heavy infection noted in a field intended for canning at Ste. Philomene, Que. (E. Lavallee).

MOSAIC (virus) was noted as follows: sl. infection on Blue Lake about Kelowna and Vernon, B.C. (G.E. Woolliams); sev. in one planting at Burdett, Alta. (M.W. Cormack); tr. on Brittle Wax at Standbridge East (E. Lavallee); and Ste. Foy, Que. (D. Leblond); row of Black Seeded Pencil Pod in garden beside gladioli at Kentville, N.S., sev. infected causing pods to be twisted; also planting of Kenearly 100% infected (K.A. Harrison).

SEED DECAY was general in the Hamilton-Toronto area, Ontario, and occasionally sev. with seed corn maggot injury in very early plantings even where the seed was treated with fungicide-insecticide dressing. Cool, wet weather prevailed during germination. A few fields were replanted (W. S. Carpenter).

BEET

LEAF SPOT (Cercospora beticola). Tr.-mod. infection was observed in the Univ. plots, Fort Garry, Man. (W.C. McDonald). Leaf spot was general in fields on Jesus Island, Que., causing premature death of older leaves (E. Lavallee). Tr. observed in one planting in Queens Co., P.E.I. (R.R. Hurst).

LEAF SPOT (Phoma betae). Tr.-sl. infection noted in 1 plot at Brooks, Alta. (M.W. Cormack). Tr. in Univ. plots, Fort Garry, Man. (W.C. McDonald).

ROOT AND STEM ROT (Rhizoctonia solani) was sev. in hot beds or greenhouses on Jesus Island, Que., where seed was not treated or soil disinfected (E. Lavallee).

SCAB (Streptomyces scabies). Tr. observed on beets from a planting in Queens Co., P.E.I. (R.R. Hurst). Tr.-sl. infection in 5 fields about Manuels, Nfld., and mod.-sev. in 3 fields at Clarkes Beach (G.C. Morgan).

BORON DEFICIENCY. Petiole cracking and internal black spots in the roots were observed in a few fields at Ste. Rose and St. Martin, Laval Co., Que. (E. Lavallee).

BROAD BEAN

POD BLACKENING (physiologic), first noticed in July, became sev. in Sept. at Ste. Foy, Que. (D. Leblond).

CABBAGE

GRAY MOLD (Botrytis cinerea) was seen in Jan. causing sev. damage to a lot of Danish Ballhead in storage in Queens Co., P.E.I. (R.R. Hurst). The disease caused complete loss of cabbage in 2 cellars at Topsail, Nfld., and some loss in 2 warehouses at St. John's (G.C. Morgan).

SOFT ROT (Erwinia carotovora) sev. affected an occasional head in gardens in Queens Co., P.E.I. (R.R. Hurst). Soft rot caused almost complete breakdown of 3 carloads of cabbage in 2 common storage warehouses in St. John's, Nfld. (G.C. Morgan).

YELLOWS (Fusarium oxysporum f. conglutinans) affected about 5% of the plants in our laboratory plots at St. Martin, Que. (E. Lavallee).

DOWNY MILDEW (Peronospora brassicae). Apparently all plants of a 100,000 shipment were infected when set out at Avonport, N.S.; however, the plants outgrew the trouble and produced a healthy crop except for lesions on the outer leaves (K.A. Harrison).

BLACK LEG (Phoma lingam) was quite general but rarely sev. in the Toronto-Hamilton area; transplants apparently infected before setting in field (W.S. Carpenter).

CLUB ROOT (Plasmodiophora brassicae) present to some degree in Chinese market gardens about Vancouver, B.C. (H.N.W. Toms). Club root was observed frequently in the Fraser Valley and on Vancouver Island. Early-planted early varieties of cauliflower appeared to be affected less than later varieties (W.R. Foster). Four reports received from the Hamilton-Toronto area; crop a total loss in some pockets in these fields (W.S. Carpenter).

The club root organism has now become widely disseminated over the Bradford Marsh from one localized area following the 1954 flood. The disease was found this year in most fields of cabbage and cauliflower examined, some fields being 5 miles from the original infested field. Root infection of cabbage and cauliflower was mod. to sev. depending on the variety in plants grown on the Muck Research Station. The land in these crops this year had not previously been planted to cruciferous plants and weedy Cruciferae are uncommon on the land. Sweet alyssum (Lobularia maritima) in flower beds on an adjacent farm was found infected. On the farm where the disease was first observed in 1953, cauliflower failed to produce a marketable crop and was later disced under (O. T. Page). Club root is the principal disease of cabbage and cauliflower on Jesus Island, Que., but varies considerably in its severity from field to field. Losses were sev. on a farm at Canrobert, where cabbages have been grown on commercial scale for the last 12 years (E. Lavallee). A 5% infection was found in a 10-acre field at St. Martin (L. Cinq-Mars). About 50% of plants were sev. diseased in a home garden at Ste. Anne de la Pocatiere and about 10% of the plants were affected in the variety plots at the Experimental Farm (R.O. Lachance). Sufficient transplants for an acre had to be discarded by a grower at Annapolis, N.S., because he selected an infested area for his seed bed (K. A. Harrison). Club root infection was 6-sl. 8-sev. in fields in Conception Bay and 5-sl. 8-mod. 11-sev./31 fields in Trinity Bay and Bonavista Bay areas, Nfld. In the farming area on the West Coast, sl.-mod. losses occurred in cabbage and swede turnips although in some cases the land had only been newly cleared. Sl. infections were noted in 22 fields in 6 separate districts (G.C. Morgan).

SCLEROTINIA ROT (S. sclerotiorum). A tr. infection was observed in the field at Woodside, N.S. (K.A. Harrison).

BLACK ROT (Xanthamonas campestris) was quite prevalent in many early crops in the Harrow-Leamington area, Ont. Source of infection proved to be infected seed which had been obtained from the usual seed companies (C.D. McKeen). Black rot was general and caused total loss of crop in some fields, particularly of cauliflower, in late July and early Aug., in the Toronto-Hamilton area. Its prevalence this season was due to cool weather, moist conditions and lack of rotation (W.S. Carpenter).

BOLTING. About 20% of the plants of Golden Acre, Green Acre and Copenhagen Market were affected in one lot of transplants although planted by several growers in King's Co., N.S. The plants had been in cold frames during a succession of cold nights when the temperature reached 23°F. When set out they made no growth on account of unfavorable weather and they received a further chilling on 24 May (K.A. Harrison).

BORON DEFICIENCY is observed periodically in the Toronto-Hamilton area, Ont.; boron mixed in the fertilizer gives practical and satisfactory control (W.S. Carpenter).

INTUMESCENCE. Galls were observed on the outer leaves of cabbage at Swift Current, Sask.; they possibly were incited by drifting soil and sand (R.J. Ledingham).

CARROT

LEAF SPOT (Cercospora carotae) was present in tr. amounts in all carrot fields in the Bradford Marsh, Ont. Petiole lesions, which resulted in girdling of the petioles and death of leaves, particularly the older ones, were more prevalent than in 1955 (O.T. Page). The disease was found in most carrot fields on Jesus Island and about Ste Therese, Que., often causing sev. defoliation in Aug. The disease is quite important in the Montreal district because defoliation prevents carrots being sold in bunches, a more profitable method of marketing than just removing the tops and selling the roots in bags (E. Lavallee).

SOFT ROT (Erwinia carotovora) The entire crop was a complete loss in low lying areas in many fields in the Niagara Peninsula, Ont., and some infection occurred on higher ground, particularly in heavy soils (J.K. Richardson). Scattered roots were mod. affected in a stored lot of carrots in Queens Co., P.E.I. (R.R. Hurst). The disease affected 5-15% of the roots in 10 fields examined in both East and West Coasts of Nfld. (G.C. Morgan).

YELLOWS (Callistephus virus 1) was less prevalent in Sask. than in recent years, although traces could be found in most carrot patches (R.J. Ledingham). Only very light infections were observed on China asters, carrots and potatoes in Sask.; this season it was scarce on weeds in road allowances. Leafhoppers were scarce until late in the season (T.C. Vanterpool). Yellows caused little loss to carrots about Forest, Ont., in 1956; population of leafhoppers was at a low level, probably because of the bad weather. In 1953 and 1955 losses from yellows ran as high as 10% and up to 30% of the plants were infected in some fields (J.R. Chard). The disease was quite general in the Niagara Peninsula, but losses were negligible (J.K. Richardson). Yellows was observed in most fields on Jesus Island, Que., but damage was light (E. Lavallee). The odd plant was found infected in a field planting at Ste Anne de la Pocatiere (R.O. Lachance). About 5% of the plants were affected in a garden in Queens Co., P.E.I. (R.R. Hurst). Sl. infections were recorded in 2 small fields in Conception Bay and in 4 commercial plantings on the West Coast, Nfld. (G.C. Morgan). It is pointed out that in the Survey reports, yellows on carrots and other hosts common to

both callistephus virus 1 and virus 1A, the 'eastern' and 'western' strains of the aster yellows virus are, for convenience, referred to callistephus virus 1. Only when it has been shown experimentally is callistephus virus 1A reported, although it may be now more prevalent than virus 1 (I. L. Conners).

CAULIFLOWER

SOFT ROT (Erwinia carototora). In a 5-acre planting at Coaldale, Alta., about 1% of the tied heads showed mod.-sev. breakdown (F. R. Harper).

CLUB ROOT (Plasmodiophora brassicae). Infection was considerable in several fields about Oakville, Ont. One grower lost 10% of his crop and many other plants were stunted because of sev. root infections (J. K. Richardson).

BACTERIAL SPOT (Pseudomonas maculicola). A sample of curds received in Aug. 1956 showed rather numerous spots on the curds. The lesions were diagnosed to be those of this pathogen. The crop was grown at Carrying Place, Prince Edward Co., Ont., in 1954 under contract for processing into pickles. The curds were shipped in brine to Winnipeg (H. N. Racicot).

PYTHIUM ROT (P. ? ultimum). A curd and stem rot developed on 10-25% of the plants in 2 commercial plantings at Salmon Arm, B. C. (G. E. Woolliams).

BLACK ROT (Xanthomonas campestris). See under Cabbage.

YELLOWS (Callistephus virus 1) was noted in Alta., on Thalaspi arvense (W. P. Campbell) and on cauliflower (L. E. Tyner). Virus 1A has been reported on cauliflower from California by Weiss (Index of Plant Diseases in The United States, p. 240 (I. L. Conners).

WHIPTAIL (Molydenum deficiency) was observed at 2 new locations in addition to 2 previously found in the Toronto-Hamilton area; sodium molybdate mixed in the fertilizer is giving adequate control (W. S. Carpenter). Crop was almost a total loss in a commercial planting at Oromocto, N. B. (S. R. Colpitts). At Cornwall, P. E. I. healthy transplants set out in a deficient soil developed symptoms of whiptail. Seedlings grown in this deficiency area showed sev. molydenum deficiency, but the condition was corrected by a spray application of sodium molybdate, 1 lb. per acre, to the foliage and soil close to the plant (J. E. Campbell). Molybdenum deficiency was very evident in P. E. I. this year because of the dry season, however, most commercial growers now recognize the early symptoms and by promptly spraying their crops suffered little loss from the disease (R. R. Hurst).

BROWN HEART (boron deficiency). A few sev. affected plants were observed in a garden in Queens Co., P.E.I. (R.R. Hurst).

CELERY

EARLY BLIGHT (Cercospora apii) still occurs quite generally in the Niagara Peninsula, Ont., but although more prevalent in some localities than others it seldom causes as sev. damage as late blight (J.K. Richardson). Outbreaks are not uncommon in the Toronto-Hamilton area and have caused damage in a few instances; disease usually checked by spraying (W.S. Carpenter). On one muck area at Ste Dorothee, Que. where celery has been grown year after year, early blight is often quite prevalent (E. Lavallee).

CENTROSPORA ROT (C. acerina). The causal organism is known to be established in fields of 4 growers in the Burlington area, Ont. Growers are now using copper-8-hydroxyquinolinate as a butt drip at harvest to prevent its development in storage (W.S. Carpenter).

SOFT ROT (Erwinia carotovora). A heart rot was observed in Chinese market gardens near Vancouver, B.C.; some 4 acres being affected. The condition was not externally visible, but in some parts of the plantings all heads showed decay when cut into (H.N.W. Toms). Soft rot caused more than the usual amount of waste in January and February. In 1956 in the Toronto-Hamilton area, Ont. considerable wet weather occurred before and during harvest (W.S. Carpenter).

NEMATODES. Galls of the root-knot nematode, Meiloidogyne hapla, were generally light on celery in the Burlington area, Ont. and easily overlooked. The root-lesion nematode, Pratylenchus penetrans was also present. The amount of damage caused by these nematodes was obscured by a heavy fertilizer program, but the numbers of root-lesion nematodes present could be correlated within the numbers of scratch-like lesions on the roots (J.L. Townshend). Root-knot nematode was found at 2 locations and large populations of the root-lesion nematode at 5 counts of the latter ran as high as 12,000 per gram of air-dried root and 400 per pound of soil. Some fumigation demonstrations are underway (N.S. Carpenter).

BACTERIAL BLIGHT (Pseudomonas apii) was prevalent in all celery fields examined in the Bradford Marsh, Ont. The disease has become increasingly important in the last 4 years. In the variety plots at the Muck Research Sta. bacterial blight ranged from tr. to mod., while late blight rarely exceeded a trace. These plots were dusted weekly with a copper-lime dust. Spraying with bordeaux is also ineffective against bacterial blight. Of the varieties tested, Emerson Pascal exhibited considerable resistance to both diseases (O.T. Page). A tr. of bacterial blight was noted in most fields in the

Toronto-Hamilton area. In one field where no fungicide was applied a heavy infection of this disease was the only one seen. It is suspected that infection was carried on seedling plants obtained from the Bradford Marsh (W.S. Carpenter).

LATE BLIGHT (Septoria apii). Mod. infection was observed in a few fields of early celery at Leamington, Ont.; the disease was not present in well-sprayed fields (C.D. McKeen). Late blight was general and sev. throughout the Niagara Peninsula this year even in fields regularly protected with a fungicide. Some growers switched from dusts to sprays in Sept. because the latter appear to be more effective (J K. Richardson). Late blight was prevalent and sev. in many fields in the Toronto-Hamilton area; several crops were lost and storage loss will be high. The thoroughness of coverage appeared to be more important than the material applied (W.S. Carpenter). No special survey was made, but many truck loads of celery on the Beausecour Market, Montreal, Que., were more or less infected with late blight (E. Lavallee).

YELLOWS (Callistephus virus 1A). A count of several thousand plants on 3 farms in the Niagara Peninsula, Ont., revealed an infection of less than 0.5% (J.K. Richardson). Aster yellows was noted on the following wild plants in Lincoln and Welland counties: Aster novae-angliae, Cichorium intybus, Daucus carota, Erigeron annuus and E. canadensis. The leafhopper, Macrosteles fascifrons (Stal) transmitted the virus from D. carota and A. novae-angliae to celery, thus indicating that infection in these plants was due to the western strain (T.R. Davidson, J.A. George). Yellows was somewhat more prevalent in the Toronto-Hamilton area than in 1955, but its incidence is much less than in 1953 and 1954 (W.S. Carpenter). About a 1% infection of yellows was observed in celery in the London-St. Thomas area (W.A. Babbitt).

BLACK HEART, believed caused by flooding, was reported from a commercial planting in Edmonton, Alta. (A.W. Henry). In 2 one-acre fields at Leamington, Ont., the later part of the early summer crop was unmarketable because of black heart, which was attributed to calcium deficiency (C.D. McKeen).

CHLOROSIS (magnesium deficiency) occurs in the Toronto-Hamilton area, Ont. on Utah Salt Lake. The addition of magnesium sulphate to late blight sprays has given variable results. It is possible that in general applications were not started early enough after transplanting, but in 5 fields where chlorosis of the lower leaves was not controlled by magnesium sulphate high counts of root-lesion nematodes were found (W.S. Carpenter). Magnesium deficiency is reported on organic soils in N.Y. State (R.A.M. 33:9. 1954) (I.L.C.).

CRACKED STEM (boron deficiency) was not prevalent this year in the Toronto-Hamilton area, Ont. A few growers are now using foliar applications in dry years. Occasionally growers in the area complain of blackening of the

mesophyll tissue in the heart petioles when celery is sold for hearts after 2 months' storage. The trouble has been attributed to boron deficiency, but work on its cause is now in progress at Guelph (W.S. Carpenter).

CUCUMBER

LEAF SPOT (Alternaria sp.). Foliage of several varieties were sev. damaged, causing 50% defoliation in the plots at Kentville, N.S. (K.A.Harrison).

GRAY MOLD (Botrytis cinerea) was more prevalent in greenhouse crops in Essex, Co., Ont., this year than at anytime during the last 4 years; cloudy, cool weather in April and May favored its development (R.W. Walsh). The disease caused the death of 3-4% of the vines in a greenhouse at Kingston, N.S.; Burpee Hybrid appeared less sev. affected than other varieties (K.A.Harrison).

SCAB (Cladosporium cucumerinum) affected 90% of the fruits in an acre planting in the Toronto-Hamilton area, Ont. where no sprays were applied. Some loss was reported by 4 other market garden growers in the area (W.S. Carpenter). Scab was much less sev. in the Montreal district, Que., than in 1955 (E. Lavallee). In a variety trial at Ste Anne de la Pocatiere, scab infection was as follows: Merveille 50%; Iran, Magnolia and Ohio MR 17 30%; Early Fortune, Everbearing and Mincu 25%; National Gate and Sure Crop 15%; Hybrid and York State 5%; SMR-2 2%; and SMR-9 tr. (L.J. Coulombe). Scab was very sev. on slicing cucumbers in the Annapolis Valley, N.S.; the resistant pickling varieties were not affected (K.A. Harrison). The disease was only observed on slicing cucumbers brought to P.E.I. for sale on the Charlottetown market. Local growers are now growing the resistant variety Highmoor; the resistant Maine No. 2 is grown for pickling (J.E. Campbell).

ANTHRACNOSE (Colletotrichum lagenarium) was recorded in one planting in the Toronto-Hamilton area, Ont., although scab was the more destructive disease in the field (W.S. Carpenter).

BACTERIAL WILT (Erwinia tracheiphila) was reported to be sev. in a garden patch at St. André Avellin, Que. (H.N. Racicot). In trials at Ottawa, Cucumis prophetarum L. and P.I. 196477, a cucumber from Brazil, were highly resistant and a selection from P.I. 200818, a short fruited cucumber from Burma, was immune. A few healthy plants were found in AODI #1 (J.J. Jasmin).

POWDERY MILDEW (Erysiphe cichoracearum) occurred in 2 fields of pickling cucumbers at Harrow, Ont., prematurely killing the crop (R.W. Walsh). Infection was rather sev. in several greenhouse crops in the Niagara Peninsula, but where Karathane was used regularly good control was obtained (J.K. Richardson). Only 1 or 2 sl. infections were observed this year in the Toronto-Hamilton area (W.S. Carpenter).

BLACK ROT (Mycosphaerella melonis) caused a wilt and death of some plants in a planting at Ste Foy, Que., by mid July. The imperfect state, Ascochyta citrullina (Chester) C.O. Smith was found on affected stems (D. Leblond, R.A. Shoemaker).

In P.D.S. 35:61, a Phomopsis is reported causing a stem canker of cucumber. C.D. McKeen (Can. J. Botany 35:46. 1951) has named the pathogen P. cucurbitae and proposed the name Phomopsis black rot for the disease (I.L. Conners).

ANGULAR LEAF SPOT (Pseudomonas lachrymans) caused sev. infections this year and last at Lamont, Alta. Typical specimens were also received from an Edmonton garden (A.W. Henry). Noted in the Univ. plots (W.P. Campbell). Only one sample of infected leaves was received for diagnosis. Both pickling factories reported contract fields in Man. comparatively free of infection (W.A.F. Hagborg). The disease was general in the Toronto-Hamilton area, Ont., but infection was not so sev. as to cause undue alarm (W.S. Carpenter). Angular leaf spot was unusually prevalent on Ile Jesus, Que., on cucumbers grown in beds in the field; many growers lost 30-50% of their crop (E. Lavallee).

DAMPING-OFF (Pythium sp.) caused 50% loss in a field of cucumbers covered with wax paper in Essex Co., Ont. Cold wet weather after planting favored development of the organism (R.W. Walsh).

FOLIAGE DECAY (Trichothecium roseum) Leaf infections occurred in two 10,000 sq. ft. greenhouses at Leamington, Ont. Lesions began around faeces of honey bees on the upper surface of the leaves and then enlarged, covering up to 50% of the leaf surface and causing defoliation (R.W. Walsh).

MOSIAC (virus). A sev. infection occurred in a 3-acre field at Leamington, Ont.; 30-40% of the fruit were unmarketable (R.W.W.). Infection of cucumbers and other cucurbits in the Botanical Garden, Montreal, Que., was so sev. that the plants had to be destroyed (P. Duval).

EGGPLANT

WILT (Verticillium albo-atrum). Sl. infection in the Univ. plots, Winnipeg, Man. (W.C. McDonald). Wherever eggplant is grown in Essex Co., Ont., 5-15% of the plants show symptoms of wilt. In heavily infested soils, a good crop can be harvested despite wilting of infected plants provided the crop is adequately irrigated (C.D. McKeen). Wilt is regularly destructive where eggplant is grown extensively in the Toronto-Hamilton area. Losses were heavier than usual in 1956; although most plants produced a crop, the fruits were small (W.S. Carpenter). Wilt was found in several small plantings observed in the Niagara Peninsula and production was materially reduced (J.K. Richardson).

ENDIVE

HEART ROT (Pseudomonas cichorii (Swingle) Stapp). In a 1/2-acre field at Leamington, Ont. 25% of the plants were infected and unmarketable. Endive has been grown in this same patch for several years and the disease has been increasing in prevalence in the last few years (R. W. Walsh). This pathogen, apparently recognized only from symptoms produced has not been previously reported in Canada (I. L. C.)

TIPBURN (physiological) caused sl. injury in a late planting of endive on a farm in Lincoln Co. Ont.; an adjacent planting set at an earlier date appeared healthy (J. K. R.)

LETTUCE

GRAY MOLD (Botrytis cinerea) was a problem in several greenhouses in the Toronto-Hamilton area, Ont. in the spring during dull, cool weather. One crop was reported to be almost a complete loss from gray mold this fall (W. S. Carpenter).

ROOT ROT (Botrytis cinerea) slightly affected the variety Black-seeded Simpson in the vegetable plots at the Univ., Vancouver, B. C. during a wet, cool June (H. N. W. Toms). Root rot was less apparent than usual about Forest, Ont. on account of the damp weather. Losses ranged up to 15%, the heaviest losses being usually in crops on land in lettuce the previous year. Plants were able to survive because new roots were sent out from the plant about the decayed root. Crop rotation of 3 or preferably 4 years has been very effective in keeping the disease at a low level (J. L. Chard). Root rot caused mod. damage in the Springdale, Ont. area. The disease was sev. in the plots of the Muck Research Sta. where lettuce has been grown for 4 successive years (O. T. Page).

DOWNY MILDEW (Bremia lactucae) caused sev. leaf infection in a garden planting at Harrow, Ont. (C. D. McKeen). Downy mildew and gray mold (Botrytis cinerea) resulted in damage to the outer leaves of mature lettuce in the Bradford Marsh, but usually the damage was not sufficient to make the heads unmarketable (O. T. Page). Many fields were sev. infected in the Montreal district, Que. The disease appears to be more prevalent than formerly (E. Lavallee).

RUST (Puccinia extensicola). A few leaves were affected at Edmonton, Alta. (A. W. Henry).

BOTTOM ROT (Rhizoctonia solani) caused some plant loss to growers of early head lettuce in the Toronto-Hamilton area, Ont. in 1955; 50% of the plants were destroyed in some plantings (W.S. Carpenter).

DROP (Sclerotinia sclerotiorum) sev. infected 50% of the plants in a plot at Brooks, Alta.; also 5% of the crop was completely rotted in a market garden planting at Medicine Hat (M.W. Cormack, F.R. Harper). The disease destroyed 2-10% of the plants grown in a bed on Ile Jesus, Que. (E. Lavallee). For a short distance at one end of a field at Grand Pre, N.S., 30% of the plants were affected; over the rest of the field, very few plants were infected (K.A. Harrison).

LEAF SPOT (Septoria lactucae) was more prevalent than usual in the s. part of Essex Co., Ont.; the lowest leaves on many plants were infected in several fields (C.D. McKeen).

YELLOWS (Callistephus virus 1). Very little yellows was observed about Forest, Ont. (J.L. Chard).

HIGH TEMPERATURE INJURY. As a result of 4 days of 90° temperatures in mid-June following a generally cool spring, the early lettuce crop in Essex Co. Ont., showed internal browning of the heads. About half the crop was unmarketable (C.D. McKeen).

MELON

LEAF SPOT (Alternaria cucumerina) was observed in many fields of muskmelons about Harrow, Ont. as the crop approached maturity (C.D. McKeen).

ANTHRACNOSE (Colletotrichum lagenarium) mod. infected stems and fruits in a 2-acre field of muskmelons at Leamington, Ont. Anthracnose lesions were also abundant on Zucca melon fruits sent from Leamington to the laboratory for diagnosis (C.D. McKeen). See also under Watermelon.

POWDERY MILDEW (Erysiphe cichoracearum) caused sev. defoliation in two 3-acre fields of Zucca melons at Leamington, Ont. when slightly over half of the crop was harvested. This melon appears to be about as susceptible as squash and pumpkin (C.D. McKeen).

FUSARIUM WILT (F. bulbigenum var. niveum). There is a noticeable spread of wilt to disease-free soils each year in s.w. Ont. thus decreasing the acreage that can be planted to susceptible muskmelon varieties; unfortunately the fruits of some resistant varieties are not so acceptable on the market as those of susceptible varieties (C.D. McKeen).

MOSAIC (virus). A 1/2-acre field of Perfection muskmelons in s.w. Ont. developed sev. leaf symptoms of mosaic and retarded growth (R.W. Walsh).

2,4-D INJURY. Two fields of early muskmelons at Leamington, Ont. were sev. damaged by drift of 2,4-D when the chemical was applied to an adjacent crop. The chemical caused yellowing and abscission of early formed fruits as well as causing sev. malformation and dwarfing of the foliage (C.D. McKeen).

ONION

PURPLE BLOTCH (Alternaria porri) caused the destruction of about 1 acre of white onions at Ste Dorothee, Laval Co. Que. (E. Lavallee).

NECK ROT (Botrytis allii). By Nov. neck rot was affecting 4-10% of the onions kept in common storage at Kelowna, B.C.; the bulbs had to be hand picked before marketing (G.E. Woolliams, M. King). From the few enquiries received since harvest, it appears that damage will be sl. in the 1956 crop in Sask.; although the disease is seldom seen in fields about Saskatoon, it occurs commonly in storage (R.J. Ledingham). A mod. infection was noted on 6 June in a planting at Roseneath, P.E.I. Lesions bearing conidiophores and conidia appeared on the plants near ground level. The early season was cool and damp (J.E. Campbell). A small amount of neck rot was present in onions offered for sale in Queens Co., P.E.I. in Jan. 1956 (R.R. Hurst).

LEAF SPOT (Botrytis squamosa) was present in tr. amounts on most onion plantings in the Bradford Marsh, Ont. in late August (O.T. Page).

Probably the same disease caused the loss of several plantings nearly ready for bunching in August in the Toronto-Hamilton area. In 1 field, tank-mix zineb sprays started at first appearance of the disease and applied weekly failed to give adequate control (W.S. Carpenter).

ANTHRACNOSE (Colletotrichum circinans). Affected red onions were received from St. Valier, Bellechasse Co. Que., 13 Aug. (D. Leblond). Because red onions are resistant to this pathogen, a specimen was requested. The red scales were indeed affected by C. circinans (DAOM 55034). According to J.C. Walker (Plant Pathology pp. 272-280. 1950) red and yellow varieties possess resistance, but if the dry outer scales are broken away and the fleshy scales exposed, the inner scales are susceptible. Also, unpigmented portions of partly colored scales are attacked by C. circinans. The latter phenomenon appears to be what took place on these red scales because acervuli are present only on the unpigmented area (R.A. Shoemaker).

PINK ROOT (Fusarium sp.) has been found for several years in the Oliver, Kelowna and Vernon districts, B.C. on fall planted Sweet Spanish onions imported from Walla Walla, Wash.; infection in June was mod.-sev. and in some fields about 40% of the onions failed to size (M. King).

BULB ROT (Fusarium oxysporum f. cepae). A tr. occurred in a planting at Brandon, Man. (J.E. Machacek).

DOWNY MILDEW (Peronospora destructor) was sev. and caused premature defoliation of the pickling varieties Silverskin, White Portugal, Australian White and White Creole planted in mats in the plots at Agassiz, B.C. (H.N.W. Toms). Only traces of downy mildew were observed in the commercial onion areas of the B.C. Interior. Its scarcity is attributed to the fact that nearly all commercial fields were sprayed with zineb (G.E. Woolliams, M. King). Downy mildew was mod.-sev. in fields examined on the Bradford Marsh, Ont. in late August (O.T. Page). The disease is rarely a problem in bunching onions in the Toronto-Hamilton area (W.S. Carpenter). Downy mildew and leaf spots caused premature drying down of the tops which resulted in sev. reduction of yield and bulb size in the cooking onion crop. In many cases yields were reduced more than 50% (J.L. Chard). A garden patch was reported infested at Eganville in July (H.N. Racicot). Downy mildew became sev. on white varieties in most onion fields on Ile Jesus, Que. about 1 Sept. In an experimental test, about 1 acre was sprayed 3 times with maneb and sticker; excellent control was obtained (E. Lavallee). A heavy late infection was found in a 2-acre field at Berwick, N.S. Its chief effect appeared to be the hastening of maturity of a very late crop. This was one of the first attempts in N.S. to raise onions commercially from seed sown in the field (K.A. Harrison).

SMUT (Urocystis cepulae). A light infection was observed in fields of Yellow Globe Danvers at Kelowna and Vernon, B.C.; first record of its occurrence at Vernon (M. King). Smut was prevalent in all onion-growing areas of the Bradford Marsh, Ont. Infections up to 84% were recorded (O.T. Page). Smut took its usual toll of onions grown on the Thetford Marsh. Formaldehyde and thiram were both fairly effective in controlling the disease (J.L. Chard). Smut caused sev. loss in 5 fields at Ste Rose and St. Vincent de Paul, Que. (E. Lavallee).

YELLOWS (Callistiphus virus 1). A tr. infection observed at Brandon, Man. (J.E. Machacek).

PARSNIP

CANKER (Itersonilia perplexans Derx) is now known from 3 farms in the Dixie Area, Ont. It caused considerable wastage in storage before the crop was sold (W.S. Carpenter). This is the first report of this disease to the Survey (I.L.C.).

LEAF SPOT (Ramularia pastinacae) mod. infected the lower leaves in a planting at Morden, Man. (W.S. McDonald).

PEA

Dr. B.H. MacNeill, Department of Botany, Ont. Agr. College, Guelph, has presented a special report on the diseases of canning peas in Ont.

ROOT ROT. During the last two seasons a root-rot survey has been carried out in the commercial canning areas of Ont. The region studied extended from Deseronto in the East to Windsor in the West and included, in particular, some large acreages in the vicinities of Picton (Prince Edward Co.), Whitby (Ontario Co.), Little Britain-Port Perry (Durham Co.), Greensville-Hannon (Wentworth Co.), Burford (Brant Co.), Simcoe-Port Dover-Port Rowan (Norfolk Co.), Chatham (Kent Co.), and Tecumseh-Leamington (Essex Co.). Samples of diseased material were taken at 10-day intervals from emergence of the plants to harvest of the crop; these samples were studied in the laboratory to determine the causal agents. Although the results for the early warm dry season of 1955 differed somewhat in detail from those for the late cold wet season of 1956, the results for both years, were essentially similar. Important pathogenic fungi isolated were Aphanomyces sp., Pythium ultimum, Rhizoctonia sp., Fusarium solani and F. oxysporum.

The relative prevalence of these fungi from week to week during the season or from season to season during this survey suggested very strongly that soil temperature was the important factor in their ecology. For most areas as the season progressed and the soil temperature rose Rhizoctonia and the Phycomycetes appeared less and less frequently. In the late season, the species of Fusarium were the dominant fungi in diseased plants. Unlike the situation in some areas in the United States, Aphanomyces appeared only infrequently and seemed not to be important in Ont. Pythium ultimum was of major importance in the early part of the season with Fusarium solani taking over in the later part. The role of a high temperature species of Fusarium found associated with a vascular disease similar to Near Wilt is being investigated. There is no evidence that nematodes were playing any significant part in the root-rot complex.

To estimate the loss of crop caused by root rot is difficult. Unless the crop is followed very closely, loss from root rot may be confused with that from flooding of the field, poor seed placement and fertilizer injury. However, there is little doubt that in spite of the universal practice of treating pea seed with fungicidal dressings, the crop suffers a great deal of damage as it emerges or shortly after. Moreover, established stands may succumb to root rot, the plants turning yellow at podding time and drying up before the crop is ready to harvest.

This survey has indicated that root rot was responsible for the complete loss of several large fields in each of the districts of Simcoe-Port Dover-Port Rowan and Tecumseh in both 1955 and 1956, while the yields of many other plantings throughout the area surveyed were seriously reduced.

VIRUS DISEASES. It was estimated that over 20% of the acreage in the Simcoe-Port Rowan area was abandoned in 1956 because of damage caused by virus diseases. Both Enation Mosaic and Streak were present in epidemic proportions. While aphids per se were not responsible for extensive damage, they were undoubtedly responsible for the widespread distribution of virus diseases in the area. It was obvious that the prolonged period of cool weather which delayed the maturing of the crop in 1956 served to favor the build-up of the vector population.

LEAF AND POD SPOT (Ascochyta pisi). A very serious outbreak of the disease was observed in a field near Copetown (Wentworth Co.). This was in the Early Sweet variety, the seed having come from Idaho. The processor estimated the reduction in yield of shelled peas at about 55%.

Other Observations

LEAF AND POD SPOT (Ascochyta pisi). A sl. infection occurred in many pea fields grown for seed in the Creston Flats, B.C. (G.E. Woolliams). Infection was a tr. in 5/17 seed fields and sl. in 1 of canning peas in s. Alta. (F.R. Harper, M.W. Cormack). The disease was widespread and sometimes sev. in Edmonton (W.P. Campbell). A sl. infection occurred on leaves, stems and pods of most plants in a 1/2-acre plot of Chancellor (Foundation stock) at the Farm, Ottawa, Ont. (V.R. Wallen). The disease became sev. in September along with Botrytis cinerea on pods of Guilbo green peas at Ste Foy, Que. (D. Leblond). Tr. infection on Stratagem in a garden in Queens Co., P.E.I. (R.R. Hurst).

POWDERY MILDEW (Erysiphe polygoni) sev. damaged a 12-acre field of Telephone peas on Lulu Island, B.C.; the summer was dry (H.N.W. Toms). The disease was mod. in 2 fields examined in early July and sev. in a number of garden plots late in the season in s. Alta. (M.W. Cormack). Tr. infection in a garden in Queens Co., P.E.I. (R.R. Hurst).

ROOT ROT (Fusarium spp. and Rhizoctonia solani). Mod.-sev. infections were noted in a number of fields of Wisconsin Early Sweet and in one of Lincoln peas grown for canning about Tabor, Alta. Tr. infection recorded in 3/17 seed fields in s. Alta. in late July. Isolations from sev. rotted roots from Creston, B.C., also yielded a high percentage of Fusarium (M.W. Cormack, F.R. Harper). About 10% of the plants in several garden

plantings at Harrow, Ont., developed a cortical rot which caused death of the plants just before harvesting (C.D. McKeen). Root rot was very prevalent in areas s. of Montreal where canning peas are grown. Several fields at Marieville, Rougemont and St. Cesaire were sev. damaged and a few were completely ruined (R. Crete).

WILT (Fusarium oxysporum) mod. infected a planting at Portage la Prairie, Man. (J.E. Machacek).

DOWNY MILDEW (Peronospora pisi). A tr. infection was present in 6/17 seed fields examined in s. Alta. (M.W.C., F.R.H.).

BACTERIAL BLIGHT (Pseudomonas pisi). A tr. infection was seen on the leaves in 2 fields in s. Alta.; no pod infection was noted (M.W.C., F.R.H.). A mod.-sev. infection was seen on leaves, stems and pods of Arthur (Foundation) in an acre plot at the Farm, Ottawa, Ont.; crop was reduced 25% because of poor seed set. Traces were also observed in Foundation plantings of Chancellor and Valley (V.R. Wallen).

LEAF BLOTCH (Septoria pisi). Infection was 3-tr. 2-sl./17 seed fields in s. Alta. A sev. infection also occurred in 1 garden planting at Lethbridge (F.R.H., M.W.C.). A tr. was recorded in the plots at Edmonton (L.E. Tyner), and small plot of Foundation seed of PE -4 garden peas at Ottawa, Ont. (V.R. Wallen).

RUST (Uromyces fabae). A tr. was observed on garden varieties in a garden in Queens Co., P.E.I. (R.R. Hurst). A sl. infection was observed in the experimental plots at St. Jean, Que. (R. Crete).

PEPPER

ANTHRACNOSE (Colletotrichum sp.) again caused sl. loss of fruit in the Toronto-Hamilton area, Ont. The crop was not sprayed (W.S. Carpenter).

DAMPING-OFF (Pythium sp. and Rhizoctonia solani) was noticeable in many greenhouses and cold frames in the Toronto-Hamilton area, Ont. (W.S.C.).

SCLEROTINIA ROT (S. sclerotiorum) destroyed a few fruits in the trial plots at the Farm, Agassiz, B.C.; it appeared after rain which was preceded by a long dry period (H.N.W. Toms).

VERTICILLIUM WILT (V. albo-atrum) was observed in fields at Kelowna and Vernon, B.C.; 10-100%, av. 20%, of the plants were affected in the diseased fields (G.E. Woolliams, M. King).

BACTERIAL SPOT (Xanthomonas vesicatoria) was unusually sev. throughout s.w. Ont. Initial infection resulted from using infected seed of some of the sweet varieties. Frequent rains spread the inoculum and weather conditions favored infection. Some crops were almost completely defoliated, resulting in losses of 60% of the crop (C.D. McKeen). One market gardener in the Toronto-Hamilton area lost his entire crop from bacterial spot and the disease was apparent in several other fields. California Wonder is very susceptible whereas Hungarian Yellow appears to possess some resistance (W.S. Carpenter).

MOSAIC (virus). The green peach aphid spread tobacco etch and cucumber mosaic viruses in a few fields of pepper about Harr[illegible] Ont. Because the build-up of the aphid population took place only late in the season these virus diseases caused less damage than usual (C.D. McKeen). Virus-infected plants were quite common in most fields planted with California Wonder types in the Toronto-Hamilton area (W.S. Carpenter).

POTATO

The data in Tables 6 to 9 on Seed Potato Certification were submitted by the Plant Protection Division, Production Service.

Both the acreage entered for certification and the acreage passed slightly exceeded the 1955 figures. Bacterial ring rot continues to be an important cause of rejection. Although fewer cases were recorded in N.B. and Que. than in 1955, the converse was true in P.E.I., which, until last year appeared to be almost free of the disease. Black leg was unusually prevalent in P.E.I. and Que. The great acreage of Sebago in P.E.I. accounts for over a third of the certified acreage. The acreage of the other leading varieties is accounted for by the large acreage of Katahdin in N.B., Irish Cobbler in P.E.I., Kennebec in N.B. and Green Mountain in Que., Netted Gem, which was about equally popular in B.C., Alta. and N.B.

EARLY BLIGHT (Alternaria solani) was reported as follows: Infection 107-sl. 1-mod. 2-sev./588 fields inspected in B.C.; present in most fields in the Interior, causing sl. reduction in yield; apparently associated with low fertility (N. Mayers); recorded in 23 (10%) of the fields in s. Alta. and in 61 (58%) in central and n. Alta; infection usually sl.-mod. (R.P. Stogryn); but again prevalent on Netted Gem after a lapse of several years, even causing some defoliation and, for the first time, well marked infection centers, similar to those caused by late blight (J.W. Marritt); noticeably prevalent in n. Sask. (A. Charlebois) where moist conditions apparently favored the disease (T.C. Vanterpool); sl.-mod. infection in 21 (15%) of the fields inspected in Man. and n.w. Ont., mostly on early varieties (D.J. Petty), sev. infected

Table 6. Seed Potato Certification: Fields and Acres Inspected and Passed, 1956

Province	Number of Fields Inspected	Number of Fields Passed	Fields Passed %	Number of Acres Inspected	Number of Acres Passed	Acres Passed %
P.E.I.	6,218	5,149	82.8	28,809	23,483	81.5
N.S.	255	228	89.4	501	424	84.6
N.B.	2,303	2,040	88.6	14,338	11,993	83.6
Que.	1,115	724	64.9	3,842	2,388	62.2
Ont.	582	487	83.7	1,828	1,419	77.6
Man.	138	129	93.5	825	749	90.8
Sask.	51	45	88.2	30	103	79.2
Alta.	220	186	84.5	1,329	1,128	84.9
B.C.	588	501	85.2	2,325	2,018	86.8
Total	11,470	9,489	82.7	53,927	43,705	81.0
Previous Yearly Totals						
1955	12,003	10,239	85.3	51,627	42,173	81.7
1954	13,783	11,959	86.8	59,360	50,686	85.4
1953	14,411	11,875	82.4	60,173	47,706	79.3
1952	12,169	10,985	90.3	45,988	41,315	89.8

Acres Inspected		Acres Passed	
1956	53,927	1956	43,705
1955	51,627	1955	42,173
Increase of 2,300 or 4.5%		Increase of 1,532 or 3.6%	

foliage of Keswick received from Thunder Bay (H.N. Racicot), general in Niagara Peninsula and poorly sprayed fields suffered sev. defoliation (J.K. Richardson); general in Toronto-Hamilton area but usually sufficiently well controlled to prevent loss (W.S. Carpenter); sl. infections occurred occasionally in seed potato fields in districts 1, 2 and 3 (J. McKercher, W.L.S. Kemp, H.W. Whiteside); infection 2-tr. 26-sl. 8-mod./59 fields in e. Ont. (E.H. Peters), and 174-sl. 19-mod./1115 fields in Que., mostly in the Lake St. John district (B. Baribeau); rarely observed in seed fields in N.B. (C.H. Godwin); reported in very few fields in sl.-mod. amounts in N.S., however, in one field for the second year in Irish Cobbler near Truro, 75% of the foliage was killed; season not particularly favorable for the disease and many growers using maneb and zineb (R.C. Layton); very little this year in P.E.I. (H.L. McLaren) except sev. infection in one field of Irish Cobbler in Queens Co. (R.R. Hurst); sl.-mod. infections in several fields in Nfld. (G.C. Morgan)

Table 7. Seed Potato Certification: Acreage Passed by Varieties, 1956

Variety	P.E.I.	N.S.	N.B.	Que.	Ont.	Man. - Alta.	B.C.	Total
Sebago	17,573	33	286	47	223	2	2	18,166
Katahdin	1,132	87	6,289	165	660	17	17	8,367
Netted Gem	71	53	1,089		1	1,075	1,460	3,749
Irish Cobbler	2,469	45	409	79	134	53	1	3,190
Green Mountain	964	37	208	1,783	17	5	46	3,060
Kennebec	558	72	2,044	220	24	57	42	3,017
Red Pontiac		1	642			197		840
Keswick	320	11	140	73	86		3	633
Russet Rural	2		589		30			621
Pontiac	141	9	188			41	61	440
Warba	37	18	7	14	20	141	92	329
Canso	178	7	28	1	14	5		233
Chippewa	8	4	20		186			218
White Rose							204	204
Columbia Russett					2	127	4	133
Cherokee	11	12	29		10	21		83
Bliss Triumph		24	24			28	1	77
Manota					1	66		67
Early Ohio						64		64
Waseca						47	1	48
Others (17)	19	11	1	6	11	34	84	166
Total	23,483	424	11,993	2,388	1,419	1,980	2,018	43,705

BLACK DOT (Colletotrichum atramentarium) was found in a garden in Edmonton, Alta. (A. W. Henry). Many tubers of Teton showed affected spots on the skin in a planting at Ste Anne de la Pocatiere, Que. Teton appears to be a susceptible variety (H. Genereux). A sl. infection was recorded in a field of Irish Cobbler in Queens Co., P.E.I. (R.R. Hurst).

BACTERIAL RING ROT (Corynebacterium sepedonicum) was found in B.C. in a field of White Rose in 1956 and during bin inspection in 4 seed stocks of the 1955 crop (N. Mayers). Ring rot was found in table stock fields on 20 farms in the Fraser Valley. Potatoes from nearly every farm in the Fraser Valley have been examined for ring rot as they went over a community grading and washing machine. A trace of ring rot was detected in potatoes from 19 farms while about 30% of tubers were affected from the remaining farms (W. R. Foster). Ring rot was found in 8 fields and it caused the rejection of 9 others in s. Alta.; of the 8 fields, 3 were Netted Gem from seed grown in Alta. and

Table 8. Seed Potato Certification: Fields Rejected on Field Inspection, 1956

Province	Leaf Roll	Mosaic	Ring Rot on Field	Ring Rot on Farm	Black Leg	Wilts	Adjacent Diseased Fields	Foreign Var.	Misc.	Total
P.E.I.	21	127	39	46	244	24	37	337	194	1,069
N.S.	6	3	-	-	4	3	2	9	-	27
N.B.	6	33	77	48	49	-	13	36	1	263
Que.	5	116	73	24	82	-	36	42	13	390
Ont.	13	13	10	6	24	4	10	8	7	95
Man.	3	-	1	-	3	1	-	1	-	9
Sask.	1	2	-	-	1	1	-	1	-	6
Alta.	-	-	10	19	3	-	-	2	-	34
B.C.	19		1	-	7	-	2	9	49	87
Total	74	294	211	143	417	33	100	445	264	1,981
Rejection as a percentage of fields:										
Inspected	0.7	2.6	0.8	1.2	3.6	0.3	0.9	3.9	2.3	17.3
Rejected	3.7	14.8	10.7	7.2	21.1	1.7	5.0	22.5	13.3	100%

Table 9. Seed Potato Certification: Average Percentage of Disease found in fields, 1956.

Average percentage disease found in	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.
Fields entered (first inspection)									
Black Leg	.42	.13	.23	.35	.13	.03	.10	.19	.05
Leaf Roll	.06	.19	.05	.07	.06	-	.17	.02	.08
Mosaic	.12	.12	.11	.37	.01	-	.24	-	.03
Fields passed (final inspection)									
Black Leg	.21	.07	.12	.12	.04	.12	.04	.09	.03
Leaf Roll	.02	.08	.04	.01	.03	.08	.05	.02	.03
Mosaic	.02	.09	.05	.04	.01	.01	.01	-	.02

the other 5 were Waseca foundation seed imported from N.D. (R.P. Stogryn). Ring rot was found in n. Alta. and it caused the rejection of 10 other fields on the same farm. In one field planted with Waseca foundation seed from Minn., 1% of the plants were infected. Traces in the other 2 fields were attributed to current infection from contaminated second-hand bags (J.W. Marritt).

In the provincial program to control bacterial ring rot in Alta., most 1955 affected stocks were cleaned up on the farm by 31 March. All storage premises on these farms were thoroughly fumigated after the clean up. To assist growers to secure fresh supplies of seed a list of sources and quantities of seed potatoes available was prepared and mailed to all commercial growers. For the second year the Department did not purchase seed stocks in s. Alta., but made arrangements with the local Certified Seed Growers' Association to accept orders from table stock growers that had to secure new seed because of ring rot. In other districts growers were directed to local and other seed channels.

The survey of the 1956 crop was carried out under conditions favorable for ring rot detection. Potato crops were sufficiently advanced for symptom expression and the inspection was nearly completed before the first killing frost. Ring rot was found in 102 farms (2,264 acres) out of 567 farms (9,297 acres) inspected, compared with last year when the disease was detected on 78 farms (1,407 acres) out of 599 farms (7,968 acres) inspected. Thus there was some increase in the incidence of ring rot, but in practically all fields where the disease was found there was but a trace of infection; in some fields only 1 or 2 plants being found after a thorough combing. With adequate supplies of Alberta grown certified seed now available, all growers that had ring rot in their potatoes in 1956 are required to obtain seed from growers whose fields have passed inspection for certification for their 1957 crop. It is hoped that the present regulations will lead to a further improvement in the ring rot picture in Alta. (W. Lobay).

Potatoes affected by ring rot were received from 8 places in Sask. (R.J. Ledingham). Ring rot was detected in one imported lot of seed before it was planted, but the disease was not observed in any seed crop inspected in Sask. No information is available of its prevalence in table stock (A. Charlebois). One field of Waseca grown from Minn. seed was rejected for ring rot in Man. According to P.J. Peters considerable ring rot occurs in table stock potatoes in certain areas as e. of the Red River, Winnipeg, Lockport and at The Pas (D.J. Petty, W.M. Whiteway). Ring rot was not detected in seed fields in the London district, Ont. (J. McKercher). It was found in a field of Chippewa in Durham Co. with the rejection of other fields on the same farm (W.L.S. King). Ring rot was found in 3 fields on one farm in district 3 and in an additional field at digging time (H.W. Whiteside). During a special third inspection in e. Ont. ring rot was found in 6 fields and resulted in the rejection of 4 others on the same farms (E.H. Peters). During the provincial ring rot survey in 1956, the disease was found on 92 farms in Ont. This is the smallest number

of positive cases reported since the survey was started 14 years ago. Two factors may have contributed to the low count. Relatively low temperatures and a plentiful supply of moisture tended to interfere with symptom expression and an early frost, particularly in n. Ont., killed the tops before the inspections were completed (D.S. MacLachlan). Ring rot was found in 73/1115 fields inspected in Que. and at harvest and bin inspection, 14 other lots were rejected. Bacterial ring rot caused the rejection of 77 fields in N.B. during field inspection and an additional 48 fields were not certified because of diseased table stock on the same farm (C.H. Godwin). Ring rot was not found in seed fields in N.S., although late fields were given a third inspection. The provincial department carried out a re-check of farms where the disease was found in 1955 and ring rot was found on one farm; a sl. infection was also found on one new farm, and one table stock grower in Kings Co. brought in an affected sample (R.C. Layton). Ring rot was found in several fields after second inspection in P.E.I. By 1 Dec., 15 positive cases in seed and 33 in table stock had been found (H.L. McLaren). It is not known how widely bacterial ring rot is distributed in Nfld. but it was found fairly widespread in certain parts of the West Coast. Sl. infections were noted in 15 fields of Arran Victory on the West Coast; light infections were also recorded in 2 fields at Torbay, 2 at Clarkes Beach and 1 at Pasadena (G.C. Morgan).

A special survey for bacterial ring rot and spindle tuber was conducted by Dr. D.S. MacLachlan in the Maritime Provinces. He reports as follows:-

During the last 2 years, there has been a renewed interest in bacterial ring rot and its control in Canada. At the same time spindle tuber has been mentioned more frequently in potato inspectors' reports. In order to gain first hand information on the prevalence of these diseases and the control methods employed in Eastern Canada a survey was made in Sept. 1956.

In recent years, bacterial ring rot has become a serious problem in P.E.I. Apparently the latest outbreak can be traced to seed stock imported from the U.S.A., but in spite of an all-out effort on the part of the growers to eliminate the disease their success to date is limited. The most important problem in P.E.I. at the moment is how to disinfect or fumigate potato bags. There are no facilities for fumigation on the Island and the cost of shipping used bags, even in large lots, for treatment to St. John, N.B. is prohibitive. Spindle tuber can be found in small amounts in most commercial fields, but in some instances 15-30% of the plants may be affected. Sebago, the principal variety grown, appears to be quite susceptible to infection with the spindle tuber virus.

Bacterial ring rot, particularly in table stock potatoes, is of great concern to government officials in N.B. It has been demonstrated in a disease-control area established a few years ago that with proper supervision and cooperation of the growers bacterial ring rot can be controlled or eliminated.

The greatest problem at the moment appears to be one of extension. Spindle tuber does not appear to be as prevalent in N.B. as in P.E.I. or Maine.

BLACK LEG (Erwinia atroseptica) was recorded in 93 (16%) of the fields inspected in B.C. and caused 7 to be rejected; it was rather evenly distributed in all sections (N. Mayers). Black leg was found in 71 (32%) of the fields inspected in s. Alta.; sev. harrowing in the spring caused sl. spread, but sev. hail damage caused abnormally high percentages of black leg in one important producing area (R.P. Stogryn). Elsewhere in Alta. black leg was found in 60 (53%) of the fields inspected. It continues to be a real threat to the production of certified seed although the favorable growing season kept the disease to a minimum in 1956. Planting whole seed has given real protection against loss provided the seed stock is free of the pathogen (J.W. Marritt). Black leg was found in 21% of the fields inspected in Sask. and caused one to be rejected (A. Charlebois). Black leg was found in 4/9 fields in n.w. Ont. and in 21/138 fields in Man; 3 fields were rejected (D.J. Petty).

SOFT ROT (Erwinia carotovora). Because the crop was well matured at harvest, very little rot occurred in district 3, Ont. (H.W. Whiteside). Lenticil infection was heavy, affecting 75% of the tuber surface, in a carload of washed potatoes shipped from Millville, N.B., when inspected at Windsor, Ont. The causal organism was isolated (H.N. Racicot, D.S. MacLachlan).

Small lenticular infections were frequent on washed potatoes in polyethene bags, also in low-lying areas in some fields in the Niagara Peninsula potatoes were a total loss from soft rot (J.K. Richardson).

POWDERY MILDEW (?Erysiphe cichoracearum) has caused trouble on certain wild Solanum species at Fredericton, N.B., for several years. In 1955 it appeared on cultivated varieties in the greenhouse. It was sev. and destructive to maturing plants in the spring and again in the fall in 1956. S. demissum and S. gibberulosum were the most susceptible of the wild species and Green Mountain, Plymouth and Delus of the cultivated varieties examined. The late blight differentials 1488b (1), 2070ab (31), 1506b (9) and 1563c (14), as well as a number of the 1955 potato seedlings, were also quite susceptible. On the other hand S. polyadenium x S. tuberosum hybrids, S. longipedicelatum, S. antipoviczii, S. stoloniferum, S. rybinii, S. bulbocastanum and the variety Merrimac were quite resistant. The perfect state has not been noticed. Karathane has been used successfully to control powdery mildew on various plants in the greenhouse (J.L. Howatt).

STORAGE ROT (Fusarium spp.). The 1955 crop in Que. did not keep well on account of adverse growing and harvesting conditions. Dry rot was observed in many bins during winter and spring, 10-40% of the tubers being affected in a few bins (B. Baribeau). The 1955 crop was harvested and stored under ideal conditions in N.B. and dry rot was rarely observed during the

winter and spring shipping season (C.H. Godwin). A few tubers of Sebago sev. affected by F. coeruleum were observed in one lot in Queens Co., P.E.I. in March 1956 (R.R. Hurst). Losses from Fusarium storage rot were sl. in the 1955 crop in P.E.I. (G.W. Ayers).

A dry storage rot caused by Fusarium was reported from Myronam, Alta. Storage rots caused by Pythium and other fungi were common in Edmonton. A dry rot caused by Phytophthora infestans was identified in Edmonton material and was probably quite prevalent (A.W. Henry).

WILT (Fusarium oxysporum, Verticillium albo-atrum). Sl. amounts of wilt were recorded in only 19/588 fields inspected in B.C. (N. Mayers). Wilt was observed in 11 fields in s. Alta. and caused sev. wilting in 2 fields of Netted Gem (R.P. Stogryn). Mostly traces occurred in 6 fields in central and n. Alta. (J.W. Marritt). Sl. infections were recorded in 10% of the fields inspected in Sask. but a sev. infection believed caused by Verticillium in a field of Kennebec resulted in its rejection (A. Charlebois). Wilt caused the rejection of one field of Waseca, but otherwise the disease was of no consequence in Man. and n.w. Ont. (D.J. Petty). Sl. infections were recorded in most fields in the London district, Ont. (J. McKercher) and in 9 fields in district 2 (W.L.S. Kemp). Wilt was observed in several fields, particularly of Keswick, in district 3 and caused rejection of 2 fields (H.W. Whiteside). The disease was seen in 8 fields and caused 2 rejections in e. Ont.; in one field of Kennebec 14% of the plants were affected (E.H. Peters). Wilt was found in 71 (6.3%) of the fields inspected in Que. and caused one rejection; the disease was found only in Kennebec (B. Baribeau). Wilt was recorded in only 20 fields in N.B. and none were rejected; it was even less prevalent than in 1955 (C.H. Godwin). Wilt was reported in 39/255 fields inspected in N.S. and caused 3 fields to be rejected; one field showed 10% infection (R.C. Layton). Wilt caused the rejection of 24 fields in P.E.I. (H.L. McLaren).

RHIZOCTONIA (Pellicularia filamentosa (R. solani). Infection was 306-sl. 140-mod. 33-sev. in 479 (81%) of the fields inspected in B.C. (N. Mayers). Sl. infection occurred in all potato fields in s. Alta. and half of the stocks showed sl.-mod. infection on the tubers. Its above normal prevalence in 1956 is attributed to the half dead condition of the tops for several weeks before the tubers were dug (R.P. Stogryn). Sl.-mod. infections were observed in 92 (81%) of the fields inspected in n. and central Alta.; scurf development on the tubers was about normal (J.W. Marritt). Rhizoctonia was present to some extent in most fields examined; the disease is responsible for considerable loss in Sask. (R.J. Ledingham). Sl. infections were seen in most fields in Man. and n.w. Ont. (D.J. Petty). A mod. infection with aerial tuber formation was observed in a field at Altona, Man. (J.E. Machacek). Fields of Irish Cobbler, Katahdin and Kennebec throughout the London district, Ont., were sl. affected (J. McKercher). Rhizoctonia caused some damage to crops on lighter soils and the sclerotia were heavy on crops unharvested after the tops

were killed by frost in district 2 (W.L.S. Kemp). Rhizoctonia was unusually prevalent in district 3; tuber infection occurred mostly in northern locations (H.W. Whiteside). Sl. infections were recorded in half the fields inspected in e. Ont. (E.H. Peters). Infection was 139-sl. 7-mod. 2-sev. in 150 (13.5%) of the fields inspected in Que. being especially prevalent in Labelle Co. Scurf development was usually sl. in 325/531 bins inspected but in 4 bins infection was sev. (B. Baribeau). About 10% of the plants and 40% of the tubers were affected in a field at Ste Clothilde (R. Crete). Only sl. infections were noted in the field in N.B. Scurf development on the tubers also appears to have been light (C.H. Godwin). Rhizoctonia development was very sl. both in the field and on the tubers in N.S. in 1956 (R.C. Layton). Traces were observed on the tubers of Irish Cobbler and Green Mountain in Queens Co., P.E.I. (R.R. Hurst). Rhizoctonia was again prevalent in Nfld. both on the east and west coast. Sl.-mod. infections were noticed, particularly in newly cleared fields at Cartyville, Robinsons and Doyles where much of the top soil had been removed and at the government land settlement, Cormac, where most farmers have not renewed their seed for 5-10 years (G.C. Morgan).

LATE BLIGHT (Phytophthora infestans) was prevalent on Vancouver Island, B.C., and caused some reduction in yield as a result of early defoliation of the vines; the disease was of little consequence on the Lower Mainland on account of dry weather during the summer (N. Mayers). Late blight was not observed in the field, but affected tubers were received from 2 growers in the Brooks and Calgary areas respectively (R.P. Stogryn) and the fungus was isolated from table stock tubers from Ranier (F.R. Harper). Mod.-sev. infections were noted in some fields in central Alta. (L.E. Tyner). A tr. infection was observed on one farm in south Edmonton and mod.-sev. infections in 3 fields at Spruce Grove (J.W. Marritt). Affected tubers were received from several localities (A.W. Henry, W.P. Campbell). Sl. infections were recorded in seed fields near Prince Albert and Norquay, Sask. and traces were noted in table stock fields near Kamsack and Yorkton (A. Charlebois). In 1956, a tr. of late blight was first seen in a field on 7 Aug. and sl.-mod. infections were observed a week later at Winnipeg and Portage la Prairie. Although the disease was never very conspicuous in the field, numerous samples of blighted tubers were received from growers after the crop was harvested. The disease was noted on tubers of Cherokee, Kennebec, Osseo, Warba and Waseca as well as unidentified varieties (J.E. Machacek). Losses usually did not exceed trace to 5% of the tubers but in the Portage area there were parts of a few fields where 50% of tubers were destroyed (D.J. Petty).

Late blight was first observed in Ont. on 23 July in a field of Irish Cobbler near Hespeler by L.V. Busch and in e. Ont. on 2 Aug. at Metcalfe, by O.W. Lachaine (C.B. Kelly). Late blight was more prevalent and sev. in the Niagara Peninsula than for many years. Regardless of the spray schedule followed no field was free from infection. Also scarcely a late crop was harvested without the use of a vinekiller (J.K. Richardson). Late blight was

widespread in the London district. In some plantings the vines were almost completely defoliated and tuber infection was high. Continued wet periods in August made a normal spray program ineffective. However, many growers by extra application of fungicide and by the killing the vines mechanically or with a chemical were able to harvest a crop nearly free of rot (J. McKercher, W.S. Babbitt). Late blight was also serious in the Blackwell area and in the Grand Bend and Thedford Marshes. It first appeared about 31 July. Katahdin and Irish Cobbler were more sev. affected than Sebago or Keswick. Top killers were used except where the tops were dead several weeks before harvest. In potatoes harvested during wet weather in September, tuber infection was high. Where growers waited until October when the weather was dry, tuber infection was fairly low. Both unfavorable growing conditions and late blight reduced the crop at least a third to a half (J.L. Chard). Some loss occurred in the Toronto-Hamilton area where some growers were unable to protect their crop properly. (W.S. Carpenter). Late blight was widespread in district 3, but very few crops suffered sev. from tuber infection (H.W. Whiteside).

Late blight was first reported in Que. near Montreal on 25 July in a field of Irish Cobbler. Spread was slow, but frequent rains and wet ground prevented growers spraying their fields regularly. By 31 Aug. nearly all unsprayed fields were affected and in some localities 10-20% of the crop was reported lost. Its spread was checked by heavy frosts at the end of August in some localities and by mid September in all other districts. Tuber infection was very light throughout the province (B. Baribeau). Late blight was mod.-sev. in unsprayed home gardens in Rouville Co. (R. Crete). Late blight was first reported in N.B. on 11 July at Kingsclear, York Co. By mid-August sl. infection was noted in many fields particularly in York and Carleton counties and sev. in few fields of early varieties inadequately protected by a fungicide and at the end of the month a sl.-mod. infection was general in these counties. The disease was less prevalent elsewhere in N.B. Tuber rot was more prevalent in the field than in 1955, but because tuber symptoms were readily observed, few affected tubers showed up upon bin inspection (C.H. Godwin).

For the 3rd consecutive year a survey was conducted at Fredericton to determine the races of the late blight fungus present in Canada except Nfld. By 14 Dec., 1956, 212 collections had been examined and 310 races had been identified. These races were isolated from potato tubers and vines and tomato fruits; 36 varieties of potatoes were represented. The results of the survey are given in Table 10.

Table 10. Distribution by Provinces of Physiologic Races of Phytophthora infestans in Canada in 1956

Physiologic Race	Provinces									
	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Total
1	1	6	1	1	1					10
2	1	3								4
3	7	8	6	4	6		1	1	1	34
4	31	7	30	18	8	2	2	1	3	102
1.2		1								1
1.3	4	23	1	1	1					30
1.4	4	59	6	6	3					78
2.4	2	2			2					6
3.4	3	11	1	18	9		1			43
1.3.4		2								2
Total	53	122	45	48	30	2	4	2	4	310

The results are based mainly on a single determination on the differential hosts. Race 4 appears to predominate as in previous years. This result may be due to the masking of race 0, which takes place in the presence of every other race. The second most prevalent race collected was race 1.4, and the third most prevalent was race 3.4. Race 1.3.4 was encountered only twice in all the collections (J.L. Howatt).

Late blight was first reported in N.S. in 1956 in Colchester Co. on 26 July. Scattered infections began to be noted by mid-August and an occasional infection was sev. One of these was in a field of Kennebec in Colchester Co. Except in this county, late blight was less sev. than in 1955. Tuber rot also appears to be light. In a blight resistance test, 7 varieties were planted at 6 illustration stations in western N.S. No late blight was observed at Rawdon but the percentage of late blight recorded at the other stations is shown in Table 11. Mr. G.G. Smeltzer provided the readings (R.C. Layton).

Table 11. Percentage of Late Blight Recorded at Illustation Stations in Western Nova Scotia

Variety	Location				
	East Stewiacke	Noel Shore	Lunenburg	Mavillette	Yarmouth
Menominee	0	4	1/2	3	42
Saco	5	15	1	15	2
Keswick	0	7	6	7	0
Empire	8	36	50	95	50
Cherokee	0	0	0	0	0
Canso	6	14	9	21	5
Kennebec	3	11	1	28	21

Although late blight was first observed in the field in P.E.I. on 24 July, 9 days earlier than in 1955 when a sev. epidemic occurred, the disease never seriously threatened the crop in 1956.

From the humidity-rainfall-temperature pattern for the first 3 weeks of July, it was predicted that late blight would appear about a week earlier than in 1955. As mentioned above it was found in the field on 24 July and in the next several days it was reported in numerous fields in all 3 counties. However, before mid August the weather changed: rain fell only once or twice a week for the next 5 weeks, mean relative humidity dropped to the 70's and temperatures were often low. Under these conditions the disease spread slowly. Growers who applied only 3 sprays had no trouble. Soon unsprayed fields were defoliated and most fields were killed down by frost or a chemical vine killer. Even in the experimental plots where an effort was made to create an epidemic by spraying the foliage with late blight spores, the plots receiving no fungicide were not more than 40% defoliated on 19 September when the tops were killed with sodium arsenite (L.C. Callbeck).

Losses from late blight were generally heavy in the early crop in Conception Bay and sl.-mod. in Trinity and Bonavista Bays, Nfld. The disease was sev. on the foliage of later varieties in Conception Bay and sl.-mod. in Trinity and Bonavista Bays, but tuber infection was generally less sev. Early frosts killed the foliage and probably reduced tuber infection. On the West Coast, there was little evidence of late blight (G.C. Morgan).

LEAK (Pythium ultimum) was rarely observed during digging operations and little developed in storage in B.C. (N. Mayers). Leak and soft rot caused breakdown in some early harvested potatoes in s. Alta., especially when packaged in plastic bags (M.W. Cormack). The disease was observed in 5 lots of Kennebec at shipping inspection this spring in Que.; infection was 1-7% (B. Baribeau).

SILVER SCURF (Spondylocladium atrovirens) was noted in a few lots of Green Mountain at bin inspection in Que., but infection was sl. (B. Baribeau). A sl. infection was seen in a few lots in N.S. (R.C. Layton). An occasional tuber was affected in a lot of Irish Cobbler in an unventilated storage in Queens Co., P.E.I. (R.R. Hurst).

POWDERY SCAB (Spongospora subterranea) sev. infected tubers on 2 farms in the Cloverdale area, B.C. (N. Mayers). The disease was reported in a few bins in Que.; infection was sl. (B. Baribeau). Powdery scab was reported in 2 lots in the Halls Harbour area, N.S.; in a field of Kennebec infection ran as high as 25% and averaged 5% (R.C. Layton). Mod. infections were noted in 5 fields on the east coast and in 4 fields on the west coast, Nfld.; these were mostly Arran Victory (G.C. Morgan).

COMMON SCAB (Streptomyces scabies) was fairly prevalent in B.C. mostly on smooth skinned varieties in the Interior (N. Mayers). Scab was rather heavy on 4 crops grown near Calgary, Alta. (R.P. Stogryn). Reports from Rumsey, Stettler, Violet Grove and Benalto indicate that common scab was particularly troublesome in these districts in 1956 (A.W. Henry), but in seed stocks sl.-mod. infections have been seen only on Warba (J.W. Marritt). Very little scab was noted in Man. and n.w. Ont. (D.J. Petty). In the London district scab was heavy on tubers from one field of Katahdin; most fields yielded fairly clean tubers (J. McKercher). Scab continues to be the major problem in the growing of potatoes in district 2, particularly on the lighter soils in the district. On the average not less than 25% of the crop is affected by sl. scab and 10-15% by mod.-sev. scab. For many growers 20-25% of the tubers have to be culled out on account of scab before the remainder can be given seed grade. Apparently potatoes have been planted so frequently on most potato growing farms that the scab organism is now abundant in nearly every field. Despite heavy and frequent rains this year, scab was about as prevalent as usual (W.L.S. Kemp). Scab was considerably less prevalent in district 3 than in 1955. However, in a field of Green Mountain in the Algoma district where the disease has seldom been observed, over 50% of the tubers were affected; investigation revealed that lime had been applied to this field several years ago (H.W. Whiteside). Scab was heavy in a few lots grown on the lower St. Lawrence, Que. (B. Baribeau). The disease was less prevalent in N.B. than in 1955 and has caused little difficulty during grading (C.H. Godwin). Scab was generally light in N.S. but in one lot of Bliss Triumph 30% of the tubers showed sev. scab (R.C. Layton). Scab infection was mod. in P.E.I. (H.L. McLaren). Scab appeared to be less prevalent than in 1955 although mod.-sev. infections were rather common in the Avalon Peninsula, Nfld; sl.-mod. infections were found in about a third of the fields inspected on the West Coast (G.C. Morgan).

WART (Synchytrium endobioticum) was widespread in e. Nfld. and losses were sev. in small garden plots. In many plots of Arran Victory, Green Mountain and Arran Pilot visited in Conception Bay and on the South Shore 80-100% of the plants were infected and yields were negligible. Other sev. infected varieties were Bliss Triumph, Arran Banner, Kerr's Pink and Irish Cobbler. From reports and letters received it is evident that disease was heavy in settlements such as Fogo Island, Carmanville and Harry's Harbour. The cool, moist weather during the growing season was nearly ideal for the development of wart. The sev. infection in e. Nfld. may be a blessing in disguise because many plot owners were spurred to take an active interest in control of the disease.

Sebago continued to show very high resistance to wart and is becoming increasingly popular not only in Conception Bay but also in other wart-infested areas.

During the wart survey on the West Coast the disease was found to be fairly widespread in the St. Georges-Port au Port areas, particularly in garden plots. Severe infections at St. Davids is a cause of much concern as this settlement borders an approved seed area (G.C. Morgan).

WILT (Verticillium albo-atrum). About 25% of the plants in a field at Altona, Man., showed wilt symptoms and some plants were dead; the pathogen was isolated from the stems (W.C. McDonald). The organism was isolated from a plant received from Fort William, Ont. (H.N. Racicot).

LEAF ROLL (virus) was reported in every province in Canada and caused the rejection of 74 fields entered for certification. Details of only a few observations will be recorded (I.L.C.). Leaf roll continues to be a major problem in s.e. B.C. and the North Okanagan areas. Applications of Malathion to the foliage are being recommended in place of DDT for the control of aphids and soil treatments for flea beetles. Little net necrosis was observed in seed stocks during bin inspection, but in crops of Netted Gem table stock in the Okanagan necrosis was severe in many cases, reducing the sale value of the tubers (N. Mayers). In district 3, Ont., Keswick and Cherokee appeared to be highly susceptible to leaf roll (H.W. Whiteside). In recent years, leaf roll has been of minor importance in N.B., and only 6 fields out of 2303 inspected were rejected (C.H. Godwin). For the first time in several years rejections on account of leaf roll occurred in N.S.; 6 fields out of 255 inspected were rejected (R.C. Layton). Leaf roll and mosaic was widely distributed on the east coast of Nfld. and was particularly sev. in fields of Arran Victory and other European varieties. Sl.-mod. infections of leaf roll were noted in 5 fields of Keswick. These diseases were not prevalent on the west coast, but mod.-sev. infections occurred on Arran Victory at Cormac where few farmers had renewed their seed stock for some time (G.C. Morgan).

MOSAIC (virus) was likewise reported in every province and caused the rejection of 294 fields entered for certification, nearly double the number rejected in 1955. Again only details from a few reports will be included (I.L.C.). Mosaic appears to be more prevalent than usual in Sask. and caused the rejection of 2 fields (A. Charlebois). Mosaic was observed most frequently in Keswick and Green Mountain in district 3, Ont. Katahdin is also affected but it shows rarely more than a mild mottle (H.W. Whiteside). Mosaic was reported in 480 (43%) of the fields inspected and caused the rejection of 116 fields in Que.; in 1955 the corresponding figures were 248 (22.5%) and 65. Masking of symptoms and heavy aphid populations in 1955 may account for the heavy incidence reported this year (B. Baribeau). Mosaic also appeared to be somewhat more prevalent in N.B. (C.H. Godwin).

VIRUSES M AND S. A special report on 'Potato Viruses M and S' has been prepared by Dr. R.H. Bagnall for the Survey as follows:-

Interveinal mosaic (IVM), a virus-incited disease of Irish Cobbler and other American potatoes, is best seen in the field during cool, cloudy weather. Affected plants show slight stunting and a diffuse interveinal foliar mottle. Presence of virus X was confirmed and the previously little-understood potato virus S was revealed in all Irish Cobbler plants, whether showing symptoms of IVM or not. Presence of a third virus in Irish Cobbler showing IVM was suspected, but no known strains of potato viruses A, F or Y were found.

Eventually, a virus designated as potato virus M was isolated from Irish Cobbler affected by IVM. Virus M was separated from virus X in the IVM complex by sap transfer to potato seedling 41956, and from virus S by passage through a source of Datura metel in which virus M becomes systemic more rapidly than virus S. Subsequently virus M was maintained in a potato seedling known to have been virus-free, and virus S. in "healthy" Seedling 41956. Serological antisera were prepared for viruses M, S. and X. Each virus could be specifically identified by this means even when all three were present. Cross-precipitin tests showed some serological relationship between viruses M and S, but the factor in common represented only a small fraction of the respective antigenic activities of the two viruses. The common component could be eliminated by cross-absorption or dilution of the antisera.

Mechanical inoculation with sap extract containing virus S, at 18° to 20°C., resulted in: local yellow spots on Chenopodium album; no local symptoms but a well-defined systemic vein-clearing and chlorotic mottle on Nicotiana debneyi; a systemic foliar necrosis on Solanum rostratum; and necrotic local lesions on guar, Cyamposis tetragonoloba. No symptoms appeared on either the cowpea Vigna sinensis or Datura metel. The latter plant was the only Datura species tested in which virus S became systemic.

Inoculated with virus M: D. metel reacted with a local and systemic spotting; cowpea with reddish local lesions; guar with necrotic local lesions; N. debneyi with irregular brownish ringlike local lesions, but without systemic symptoms; and S. rostratum with a necrotic streaking of the stem, petioles, and leaf veins. C. album developed no symptoms.

Tomato and eggplant were symptomless hosts of virus M but were immune from virus S. Physalis philadelphica was a systemic host of virus S only. Several species of Datura, D. bernhardii in particular, developed local lesions in response to combined virus S and virus M inoculum, but no clear symptoms to either virus alone. Virus M alone became systemic, inciting necrotic ringlike lesions, when scions bearing the two viruses were grafted to these Datura species. Capsicum annuum, Nicotiana tabacum, and N. glutinosa were immune from both virus S and virus M. Virus M alone, from a mixture of the two, survived 10 minutes heating at 65°C. Virus S alone survived 4 days at 20°C.

Eighty varieties of potatoes from Canada, Europe, and the United States were tested serologically for the presence of virus S. The great majority of these varieties, all or in part, proved to be infected. This indicates that virus S rivals virus X as the most widespread amongst the potato viruses. Numerous older varieties appear to be entirely infected with both. Varieties free from

virus S included: Alpha, Jubel, Saco, Sebago, and Voran. Sebago has been infected with virus S by grafting, but not by sap inoculation. Despite repeated attempts, Saco has not been infected by either method.

In a number of potato varieties, the common strains of virus S alone produced a slightly ruffled "off-type" appearance and a few necrotic lesions surrounded by dark green spots on mature lower leaves. Strains of virus S are known which incite a necrotic spotting and "bronzing" on the foliage of certain varieties. It is doubtful, however, if the presence of this virus could be safely predicted on the basis of symptoms on potatoes. A significant reduction in yield resulting from virus S infection has been reported in Europe. Our own approach to the problem has been to make in the first place a thorough study of the virus itself; consequently little work on symptomatology on potato, or on yield factors has been done as yet.

Viruses M, S. and X have also been isolated from Green Mountain potatoes showing Schultz and Folsom's "leafrolling mosaic" (Solanum virus II of Smith). The varieties Fortuna and King Edward reported in Europe to harbor strains of virus S were shown to contain both virus M and virus S. Interveinal mosaic and leafrolling mosaic have been reported from time to time in the United States and Canada, and an apparently similar disease termed "curl" has been reported in Germany. Nevertheless, little is definitely known of the incidence of potato virus M.

Little is known either concerning varietal resistance towards virus M. The variety Saco, which appears to be immune from viruses S and X (and field immune from virus A), was readily infected with virus M by sap inoculation. This method was recently used to separate virus M from virus S.

The isolation of virus M from the King Edward variety was of particular interest. There is now good evidence that this virus is responsible for the "paracrinkle disease" which is latent in the King Edward variety, but which develops symptoms in other varieties grafted with King Edward scions. The "paracrinkle virus" was frequently mentioned in discussions of virus origin as an example of a virus having originated "de novo" from plant components. It had been shown by previous workers to be present in all King Edward plants tested by the grafting procedure, but it had not been found elsewhere in nature and no natural means of transmission had been demonstrated. The present work, so far as is known, is the first in which the "paracrinkle virus", as distinct from virus S, has been identified with a virus occuring naturally in a potato other than King Edward. Furthermore, numerous varieties of potato are known to be latent carriers of specific viruses. The "paracrinkle virus" latent in King Edward potato can, therefore, no longer be regarded as unique.

For an account of the original isolation of virus M see Bagnall, R.H., R.H. Larson and J.C. Walker, University Wis. Research Bull. 198. 1956, and summary in Am. Potato J. 33:271-273. 1956 (I.L. Conners).

PURPLE OR BUNCH TOP (virus). Sl. infections were noted in Alta., Sask., Man. in n. and e. Ont., Que., N.B., N.S. and P.E.I. and generally appeared to be less prevalent than in 1955 (I.L.C.).

HAYWIRE (virus)was in tr. amounts in 5 fields of Netted Gem in s. Alta. (R.P. Stogryn), and in 24 (21%)of the fields inspected elsewhere in Alta. It appeared to be sl. more prevalent (J.W. Marritt). Ten fields in the Pemberton district, B.C., showed symptoms that appeared to be those of haywire infections never over a tr. (N. Mayers).

SPINDLE TUBER (virus) occurred in negligible amounts in Man. and n.w. Ont. (D.J. Petty). Two fields of Katahdin were rejected in the Lafontaine area in district 3 (H.W. Whiteside). In Que. a few affected plants were observed in 3 fields and a few tubers found in 7 lots on bin inspection (B. Baribeau). Small amounts were observed in N.B. in a few bins of lots of the more susceptible varieties. No fields were rejected; it appeared to be less prevalent than in 1955 (C.H. Godwin). Tr.-sl. infections were reported in N.S. in several fields but none were rejected (R.C. Layton). Spindle tuber caused the rejection of 58 fields in P.E.I. in 1956 compared with 30 in 1955 (H.L. McLaren). Spindle tuber caused 10% infections in 12 fields of Arran Victory on the East Coast of Nfld., and 5-15% infections in 20 fields of the same variety at Cormac in the West Coast area (G.C. Morgan). See also MacLachlan's survey in Eastern Canada, p. 72.

WITCHES' BROOM (virus) was noted in several fields in the Cariboo, and in small amounts in some other districts in B.C. (N. Mayers). The disease was recorded in one field of Warba in s. Alta. (R.P. Stogryn), and in 24 (21%) of the fields inspected elsewhere in Alta. It appeared to be sl. more prevalent than usual (J.W. Marritt).

YELLOW DWARF (virus). A few affected plants were found in fields of Katahdin at Strathroy and Komoka, Ont. (J. McKercher).

ENLARGED LENTICILS (nonparasitic). About half the tubers in low end of a field of Sebago in Queens Co., P.E.I. were sev. affected; soft rot was also present (R.R. Hurst). In several fields in the Ridgeville area, Ont., almost every tuber showed several lenticils enlarged (J.K. Richardson).

FROST INJURY. Killing of tops by frost caused a few cases of stem-end discoloration in B.C. (N. Mayers). Field frost caused some damage in the Peers-Edson area, Alta. (J.W. Marritt). Frost damage was remarkably light on tubers in fields of Sebago, in e. Ont., although the tops were green until frozen in late September (E.H. Peters). Owing to unfavorable weather in the fall digging was delayed in Que. and late heavy frost caused damage to the tubers. In about 40% of the bins inspected 1-7% of the tubers were affected.

Frost also caused some stem-end discoloration in a few bins (B. Baribeau). Field frosts during the harvest period caused fairly extensive damage in N.B. particularly in the northern sections. Sev. frost damage occurred 11-12 Oct. when temperature reached 16-20°F. Because of tuber breakdown in several carload lots, they had to be regraded (C.H. Godwin). Because the crop was planted late and the growing season cool a great many fields were green until killed by frost. The quality of the crop in N.S. was considerably reduced (R.C. Layton). Frost on 17 Sept. completely defoliated the potato crop on the West Coast of Nfld.; yields were considerably reduced at Cormac (G.C. Morgan).

GIANT HILL. Somewhat atypical plants singly or in units were reported in several varieties, particularly Green Mountain, Irish Cobbler and Netted Gem throughout N.S. In one field of Green Mountain 1/2% of the plants were affected (R.C. Layton).

HEAT NECROSIS. Internal discoloration caused by extreme heat particularly on light soils was uncommon in district 3, Ont. this year (H.W. Whiteside).

HOLLOW HEART. Although the tubers were generally smaller than usual in the crops in s.e. B.C., hollow heart was present in some lots. It was also found in a few bins in the North Okanagan (N. Mayers). Traces were seen in one bin of Irish Cobbler grown in Queens Co., P.E.I. (R.R. Hurst)

LIGHTNING INJURY. Lightning struck several times on a farm at Englehart, Ont.; several areas about 30 feet in diameter were completely destroyed (H.W. Whiteside).

MAGNESIUM DEFICIENCY. Scattered plants were affected in a field of Irish Cobbler at North Wiltshire, P.E.I. (R.R. Hurst).

STEM STREAK NECROSIS (manganese toxicity) was troublesome in several areas where the soil is light in P.E.I., Sebago being most commonly affected (L.C. Callbeck). The disorder has been described by D.B. Robinson and L.C. Callbeck in Am. Potato J. 32:418-423. 1955 (I.L.C.).

PUMPKIN

POWDERY MILDEW (Erysiphe cichoracearum) caused sev. defoliation in late Aug. and Sept. in Essex Co., Ont. (C.D. McKeen).

STORAGE ROTS were sev. in Oct. in pumpkins grown at Ste Foy, Que. (D. Leblond). Helminthosporium sorokinianum was the only pathogenic fungus recognized on the specimens sent (R.A. Shoemaker).

MOSAIC (virus). About 50% of the plants of an unnamed variety were affected in fields at Kelowna, B.C. The seed had been supplied by Canadian Canners. The disease occurred in every field planted with this variety. This observation seems to corroborate Bewley's statement (cf. K. Smith Textbook of plant virus diseases, Churchill, London. 1937, p. 54) that the disease is seed-borne (G.E. Woolliams, M. King).

RADISH

BLACK ROOT (Aphanomyces raphani) destroyed 35% of the plants in a garden at Highbury, N.S. (K.A. Harrison).

SQUASH

LEAF SPOT (Septoria cucurbitacearum) was sev. at Kentville, N.S. in a field of squash that had produced an infected crop in 1955. Commercial fields were unaffected where the crops were rotated (D.W. Creelman).

ROT (various fungi) affected 10-20% of fruits of 1500 bu. of Butternut squash from a field in Oxford Co., Ont. (J.K. Richardson).

MOSAIC (virus) affected several plants of Mammoth Table Queen in a row at the Exp. Farm, Agassiz, B.C. The virus was transmitted to cucumber (H.N.W. Toms).

SWEET CORN

EAR ROT (Fusarium sp.). A tr. was observed at La Gorgendiere, Que. at the provincial school farm at harvest time (D. Leblond).

RUST (Puccinia sorghi) sl. infected a 7-acre field of canning corn at St. Louis de Gonzague, Que. (R. Crete).

SEED ROT (organisms undetermined). Most of the early crop was a complete loss about Jemseg, N.B. because of failure of seed to grow; the weather was cold and wet (S.R. Colpitts).

SMUT (Ustilago maydis). Affected specimens were received from a field near Saskatoon, Sask. (R.J. Ledingham). Several affected specimens were received from places in the Annapolis Valley, N.S. (K.A. Harrison).

MAGNESIUM DEFICIENCY was mod. on corn examined at St Nicholas and Ste. Foy, Que. (D. Leblond).

TOBACCO

A special report on "Tobacco Diseases" was prepared by Dr. Z.A. Patrick and Dr. L.W. Koch.

SEEDBED DISEASES

BLUE MOLD OR DOWNY MILDEW (Peronospora tabacina). No cases of blue mold were observed in seedbeds in the Old or New Tobacco Belts of Ontario and as yet this disease has not appeared in Quebec. As it is well known that blue mold spores can be carried by the winds for long distances and in all instances where serious outbreaks of this disease have occurred in Canada the inoculum, in the form of spore showers, came from the tobacco growing areas of the United States, the growers are strongly advised to follow a regular spray program for blue mold control. The recommended program for blue mold control (P.D.S. 34: 95) has also been found to aid considerably in the control of damping-off organisms.

DAMPING-OFF OR BED ROT (Pythium spp. and Rhizoctonia solani) was present in most of the seedbeds. In most instances, however, it occurred in a few small patches in the bed and did not cause much damage. There were a few instances, however, where, due to crowding of plants and faulty watering, the loss of plants was heavy.

YELLOW PATCH (excessive nutrients). Next to damping-off, yellow patch was the most common seedbed trouble especially in the burley tobacco area. This condition arises in most instances as a result of over fertilizing the seedbed during preparation and often as a result of seeding too soon after steaming the soil.

CHEMICAL INJURY There were still a few cases of 2,4-D injury due to the use of improperly cleaned sprayers.

FIELD DISEASES

BLUE MOLD (Perenospora tabacina). A few outbreaks of blue mold occurred in fields in the Delhi area. This was the result of spores carried by the winds from the tobacco growing regions of the U.S. s. and s.w. of Lake Erie. The spore showers occurred around 20-25 July. Fortunately in most of the tobacco growing areas around Delhi the environmental conditions were not suitable for fungus infection and consequently the disease did not become established. In a few low lying fields there was some damage.

BROWN ROOT ROT (nematodes) is one of the most serious diseases of burley and flue tobacco. The disease was widespread, occurring in all the tobacco growing areas. It was most sev. in light sandy soils following a rye rotation. Large populations of the root-lesion nematodes, Pratylenchus spp., were found in these soils.

BLACK ROOT ROT (Thielaviopsis basicola). On account of cold and wet weather in the early part of the season some black root rot damage was noted. Although the tobacco varieties used in Canada are moderately resistant to black root rot and in the past the damage caused by this disease has been negligible, unfavorable growing conditions in some areas during 1956 resulted in some black root rot damage. Most of this damage, however, was confined to low lying parts of the field.

FRENCHING (?soil toxins). A few fields, mainly those on soils marginal for growing tobacco, were moderately damaged by frenching.

SOFT ROT (Pythium spp.) and SORE SHIN (Rhizoctonia solani) were both found in a number of fields and caused mod. losses in the new transplants.

FUSARIUM WILT (F. oxysporum var. nicotianae). A few fields were found where a few plants were infected.

ANGULAR LEAF-SPOT AND WILDFIRE (Pseudomonas tabaci and P. angulata). These leaf spot diseases causing large irregular brown and black lesions on the leaves were found in a number of fields at the end of July. Although the leaves affected were not suitable for harvest only a few plants in each field were affected.

NONPARASITIC LEAF SPOT (cause undetermined) was widespread in 1956 throughout most of the flue tobacco growing regions of Ont. Loss in yield was mod.-sev. and it also caused a considerable reduction in quality. The disease appears to be physiological in nature brought about by the interaction of certain nutritional and environmental conditions.

BROWN SPOT (Alternaria longipes (Ell. & Ev.) Mason) was also quite common on flue cured tobacco. It was found on maturing leaves. The lesions are large, circular and frequently marked by concentric rings. (This pathogen has not been previously reported in Can., although according to J.W. Groves, he has detected it once on seed. - I.L.C.).

FROGEYE (Cercospora nicotianae) is another disease attacking maturing leaves. The lesions in this case are small, one-fourth inch or less in diameter, and the centers are often parchment-like, with a scattering of minute, black dots: The damage from these two diseases was sl.-mod.

MOSAIC (virus). Injury from TMV was widespread throughout the burley, dark and flue-cured tobacco growing areas of Ont. and Que.

ETCH (virus). Damage from etch to burley tobacco was not as serious as in 1955. However, a number of fields in the Leamington-Harrow areas of Ont. showed up to 75% infection. Some etch was also noted on flue-cured tobacco.

OTHER VIRUS DISEASES. There were several other virus diseases present in the field throughout the tobacco growing areas of Ont. and Que. However, only a few plants were affected in each field and the losses were negligible. The viruses included ring-spot virus, streak virus, vein-banding virus and several of the cucumber-mosaic and potato viruses.

SUMMARY

In general the predominant feature of the tobacco disease picture in the tobacco growing areas of Ont. during the 1956 season has been the increasing severity and economic importance of leaf spots, mainly of the non-parasitic type which are often referred to as "physiological leaf spots", "weather fleck", and "immature firing". The exact causal factors responsible for these leaf disorders are as yet unknown. Another potentially serious trend in the tobacco disease situation noted in the last few years is the increasing number of cases of brown root rot in fields which have been following the typical rye-tobacco rotation for some time.

TOMATO

Dr. W.G. Benedict has prepared a special report on "Diseases of Canning Tomatoes in southwestern Ontario in 1956."

The disease situation in canning tomatoes in s.w. Ont. in 1956 was characterized by (a) an early serious development of early blight and Septoria blight in the transplant beds, (b) an epidemic of tomato anthracnose in mid-September predominantly in fields located on sandy soils and (c) a preponderance of soft rots on fruits especially in fields located on clay soils.

EARLY BLIGHT (Alternaria solani). On 25 April primary inoculum was found on overwintered, infected tomato debris. Near Harrow 400 stems were picked at random from 4 unplowed tomato fields on Brookston clay loam and 4 fields on Perth clay loam. A. solani was found infecting 169 stems; 421 sporulating lesions were present on 225 sq. in. of the infected stems. Because of generally cool temperatures and heavy rains during May and June much of the clay land could not be prepared for transplanting. Consequently young plants

remained in the outdoor beds. While being so held, a short period of hot humid weather, 11-15 June, with day temperatures over 90°F. and night temperatures above 70°F. contributed to heavy natural infection by early blight. Frequent surveys of growers' establishments indicated that some defoliation of young plants occurred in the beds and most plants were infected with early blight as they were transplanted into the fields during the whole month of June. Some of this early blight was checked by "trailing in" the plants which covered with soil most of the stem and the lower leaves. On 6 July a survey of late tomato fields on sandy soil in the Harrow-Colchester districts showed that early blight lesions were abundant on the foliage. A similar survey of 13 late tomato fields on clay soil on 10 July showed only 2 heavily infected by early blight. However, the first application of fungicide around 8 July reduced the incidence of early blight to low levels in these fields. Later, in August, in unsprayed fields of tomatoes early blight occurred in epidemic proportions and caused some defoliation of plants. By 5 September when the first tomatoes began to be picked, many fields located on sandy soils the plants of Clark's Special, Rutgers, John Baer, Redjacket and some other varieties were 75% defoliated and the earlier variety Ferguson was 90% defoliated. Early blight was not a problem in fields sprayed regularly with a suitable fungicide up to this time. About mid-September and for 3 weeks thereafter, some to all of the foliage was infected by early blight in nearly every field. Heavy infection of the stems was also noted on a survey of fields on 1 October.

SEPTORIA BLIGHT (S. lycopersici). The disease picture presented by Septoria blight resembled closely that of early blight throughout 1956 with one difference. There were about 4 times as many lesions of Septoria blight as those of early blight on the overwintering stems: 1606 sporulating lesions on 221 sq. in. of 151 of the 400 stems collected on 25 April. In general about 4 out of 5 of the leaf spots on young plants and more than 1/2 of the defoliation of older plants in the unsprayed fields in August and later was due to infections by Septoria blight. Before the harvest began it was as readily kept under control by fungicidal sprays applied to the foliage but it built up later and was quite evident on the stems.

ANTHRACNOSE (Colletotrichum phomoides). The first anthracnose lesions appeared on late crops of Ferguson, Redjacket and Early Rutgers, on 17 Aug. in unsprayed plots located on sandy loam at Harrow. (Lesions had been found on early tomatoes in the same locality 2 days earlier.) As other varieties of late tomatoes produced red ripe fruit more anthracnose was found. The incidence of anthracnose in Ferguson, which was defoliated early in September, was so high by 5 September that the fruits were not worth picking. More than 90% of the ripe and near ripe fruits showed one or more anthracnose lesions. The incidence of anthracnose on the same date in 7 other varieties of tomatoes that were unsprayed and located on sandy loam is shown in Table 12.

Table 12. Incidence of Anthracnose and other Rots in 7 Varieties of Unsprayed Tomatoes on Sandy Loam at Harrow

Variety	Fruits harvested from 25 plants	Percentage of Fruits Disease free	Rotted	Anthracnose-infected
John Baer	679	41	41	18
Rutgers	679	53	35	11
STEP No. 174*	987	58	21	21
Homestead No. 2*	1253	63	22	14
Clark's Special	703	66	18	16
Redjacket	885	70	16	14
CRW No. 169*	783	80	15	5

*Varieties reputed to have some resistance to anthracnose: seed obtained from C.F. Andrus, Vegetable Breeding Laboratory, Charleston, S.C.

In Table 12 the varieties are listed in order of increasing percentage of disease-free fruits harvested. The variety CRW No. 169 alone showed a low incidence of both anthracnose and other fruit rots.

Further, the increase in the incidence of anthracnose in the tomato crop was very great after mid September as indicated in Table 13.

Table 13. Incidence of Anthracnose at two Harvest Dates

Treatment	Harvest date	Disease-free	Rotted	Anthracnose-infected
Unsprayed check	Sept. 13	66	18	16
Sprayed with Manzate	" 13	87	12	1
Unsprayed check	" 28	28	8	64
Sprayed with Manzate	" 28	42	10	48

The data in Table 13 show that a 48% increase in loss from anthracnose occurred in both the unsprayed and sprayed plots of tomatoes, during a harvest period of 15 days. Also anthracnose was virtually controlled as long as the fungicide was effective. The last application of fungicide to the sprayed plots was made on September 6. The tomato was Clark's Special, which was the most important variety grown locally in 1956.

Finally, soil type seems to have a distinct influence upon the incidence of anthracnose in the tomato crop as seen in Table 14.

Table 14. Effect of Soil Type and Spraying on the Incidence of Tomato Anthracnose

Soil type	Treatment	Fields	Percentage of Fruits		
			Disease-free	Rotted	Anthracnose-infected
Clay	Sprayed	13	78	20	2
Clay	Unsprayed	8	64	34	2
Sand	Sprayed	7	73	21	6
Sand	Unsprayed	9	57	23	20

The data in Table 14 show that Manzate applied to 6 Sept. at the rate of 3 lb. per acre did not decrease the incidence of anthracnose in tomato fields located on clay soil but decreased by 14% the fruits lost because of fruit rots other than anthracnose. On the other hand, in tomatoes grown on sandy soil the fungicide had the effect of reducing the amount of anthracnose-infected fruits by 14% while the loss due to other fruit rots remained about the same.

LATE BLIGHT (Phytophthora infestans). None was found on tomatoes in Essex and Kent Counties in 1956.

Other diseases noted this year were Brown Wall (tobacco mosaic virus), Streak (virus), and Fruit Rots caused by bacteria and Rhizoctonia solani. The fruit rots caused losses of 8-41% of the fruits (see Tables 11 and 12) depending upon variety, soil type, and time of year but were generally more serious among common tomato varieties extensively grown on clay soils. Greatest losses occurred during the peak of the harvest season.

Other Observations

EARLY BLIGHT (Alternaria solani) apparently caused sev. damage to a field of tomatoes at Cochin, Sask. (R. J. Ledingham). Sl. infection in a planting at Morden, Man. (J. E. Machacek). Early blight was extremely sev. in the Niagara Peninsula, Ont., on both staked and canning crops. Every planting was infected and many were so sev. defoliated that losses were heavy both in yield and quality. Because of early infection and conditions favorable for disease development, the usual spray schedule was ineffective (J. K. Richardson). Early blight was quite general throughout the Toronto-Hamilton district. In many cases the spray program failed to prevent its spread and by 7 Sept. many plantings were defoliated. Only in plantings sprayed regularly at weekly intervals with either maneb or zineb were not defoliated. This program is only economical in the fresh market crop (W. S. Carpenter). Sl. infection at St Jean (R. Crete), and at St Roch, Que. (L. J. Coulombe). Early blight was general in Sunbury and Queens counties, N. B. but in only two of the fields inspected was there any loss (S. R. Colpitts).

NAIL-HEAD SPOT (Alternaria tomato). A sl. infection was noted on the fruit in a commercial planting at Plum Coulee, Man; the plants were from Ont. (J.E. Machacek).

BOTRYTIS RING SPOT (B. cinerea) affected a few fruits in a greenhouse crop at Brighton, Ont. (H.N. Racicot).

GRAY MOLD ROT (Botrytis cinerea) affected 3% of the fruits in a garden at Ste Foy, Que. (D. Leblond) and 2% in a small market garden near Charlottetown, P.E.I. (J.E. Campbell). Grey mold caused a few insignificant stem lesions about pruning wounds in a greenhouse at Falmouth N.S.; Captan dust was being used. About 30% of the fruit (10,000 baskets) were lost from rot following a spell of dull humid weather in a field at Berwick. The field was being irrigated with various fertilizers and a small quantity of sugar added. Dichlone and Zineb were ineffective; Thylate gave some control (K.A. Harrison).

LEAF MOLD (Cladosporium fulvum) was reported by greenhouse growers in the Lower Fraser Valley, B.C., even in varieties supposedly resistant; the greenhouses were poorly ventilated (H.N.W. Toms). Leaf mold appeared on a staked tomato crop in the Toronto-Hamilton area, Ont. on 1 Aug., but it caused little damage as the weather cleared almost immediately (W.A. Carpenter).

ANTHRACNOSE (Colletotrichum phomoides). A single tomato fruit attacked by late blight from a garden at Saskatoon, Sask., developed anthracnose after storage in a refrigerator for some time. This is the first time that I have seen the disease in Sask. (T.C. Vanterpool). Anthracnose was quite prevalent in the Toronto-Hamilton area, Ont., on field tomatoes, where the crop was largely defoliated by early blight (W.S. Carpenter). It was also quite general in the Niagara Peninsula, although apparently less sev. than in 1955 (J.K. Richardson). A sl. infection was recorded in the experimental plots at St. Martin, Que. (E. Lavallee).

During a study on anthracnose, a strain of C. phomoides that produces the perfect state in culture was isolated. The morphology of the perithecia, asci and ascospores conform with the description of Glomerella phomoides Swank (Phytopathology 43:285-287. 1953).

Of hundreds of isolates made at this laboratory from affected tomatoes sent in by canners in s.w. Ont. this fall, none produced perithecia in culture. All of the cultures taken from a fruit in my own garden at London, however, produced perithecia on PDA in a couple of weeks. As these isolations were made by the plate dilution method from a spore mass on the surface of the fruit the majority of the discrete colonies undoubtedly originated from single conidia. They differed from isolates from other sources in producing a reddish pigment in the medium. They also produced fewer sclerotia and these were submerged, usually at the bottom of the agar (L.T. Richardson).

BACTERIAL CANKER (Corynebacterium michiganense) was observed in an occasional field at Ashcroft and Vernon, B.C., where it caused fruit spotting (G.E. Woolliams, M. King).

COLLAR ROT (?Fusarium sp.) caused sev. rotting, at the soil line, of several plants in a garden at Lethbridge, Alta. (M.W. Cormack).

PHOMA ROT (P. destructiva) caused mod. damage in a garden at Ste Foy, Que. (D. Leblond). A few diseased fruits were found in field plots at St. Pacome (L.J. Coulombe).

BACTERIAL SPECK (Pseudomonas tomato). About 50% of the seedlings were discarded by a grower at Morden, Man., on account of infection by the disease; the seed had been produced locally and sown without treatment (W.A.F. Hagborg).

LATE BLIGHT (Phytophthora infestans). Because of a dry, sunn, summer, crop was ripening better than usual by the end of August when blight appeared at the Exp. Farm, Agassiz, B.C. The remaining crop of all varieties became a total loss by 26 Sept. following a period of rain and cool weather in mid-September (H.N.W. Toms). One affected fruit was received from a garden in Saskatoon, Sask. Reports supported by specimens indicate considerable fruit rot occurred in the Yorkton area (R.J. Ledingham), and at Windthorst (T.C. Vanterpool). A diseased fruit was received from Hamiota, Man. (J.E. Machacek). Late blight was reported from several localities in the Niagara Peninsula, Ont. A diseased fruit was received from Dunville on 16 Aug. (J.K. Richardson). Symptoms suggestive of late blight appeared in the Toronto-Hamilton area in August but it was only in a field not regularly sprayed that the disease appeared on fruits and stems after the defoliation of the plants by early blight (W.S. Carpenter).

Late blight first appeared on 27 Aug. in the experimental plots at St. Martin, Que. but by 15 Sept. over 40% of the crop was infested (E. Lavallee). The disease destroyed 60% of the crop in the Botanical Garden, Montreal (P. Duval), and 47% in a garden at Ste Foy (D. Leblond). Late blight was general on tomatoes in Sunbury and Queens Counties, N.B.; in some plantings up to 80% of the crop was destroyed (S.R. Colpitts). A sl. general infection developed on unsprayed plots at Kentville, N.S. the last 10 days of September, but frost killed most of the plants on 1 Oct. (K.A. Harrison).

DAMPING-OFF (Pythium, etc.) was generally present in many plant growers' greenhouses and cold frames in the Toronto-Hamilton area, Ont. Small losses occurred in many (W.S. Carpenter). Damping-off was general in most greenhouses in Sunbury and Queens counties, N.B.; losses were negligible (S.R. Colpitts).

SCLEROTINIA ROT (S. sclerotiorum). About 5% of the fruits were affected by this rot in the plots at St. Martin, Que. (E. Lavallee). A 3% infection was seen in a 2-acre field under irrigation at Berwick, N.S. A neighboring field of lettuce had suffered earlier from Sclerotinia rot (K. A. Harrison).

SEPTORIA LEAF SPOT (S. lycopersici). A sl. infection was seen at Morden, Man. (J.E. Machacek). In some unsprayed fields grown for fresh fruit in s.w. Ont. this leaf spot caused early defoliation. The more general use of protective sprays has reduced its prevalence greatly in the last 5 years (C.D. McKeen). This disease and early blight caused considerable defoliation in fields in the Niagara Peninsula (J.K. Richardson). The same situation held in the Toronto-Hamilton area; perhaps Septoria leaf spot was the more sev. of the two (W.S. Carpenter). Two acres of Ferguson tomato was sev. defoliated by Septoria leaf spot near Vineland while several adjacent acres of Stokesdale and Longred were much less sev. affected although stem lesions were present (G.W. Eaton). The variety Ferguson was grown commercially on a large scale for the first time in 1956. Observations made in these plantings indicate that the variety is extremely susceptible to Septoria leaf spot. In certain areas in Essex Co., where it was possible to compare, side by side, unsprayed Ferguson with unsprayed standard varieties it was obvious that the new variety was completely lacking in field resistance to the disease (B.H. MacNeill). Mod. infected leaves were seen from a garden at Ottawa (H.N. Racicot).

VERTICILLIUM WILT (V. albo-atrum) caused very little damage to the tomato crop this year in the Okanagan and Thompson Valleys, B.C. Traces only were recorded on Gem, Clark's Early and Earliana in August. The summer has been warm and sunny, favorable to tomato growth (G.E. Woolliams, M. King). According to L. Lyall, a few plants were affected in every field examined both at the Substation, Smithfield, Ont., and in commercial fields in the Brighton area and in Prince Edward Co. Isolations attempted from 2 plants; one from Smithfield yielded the pathogen (H.N. Racicot). Verticillium wilt occurred in 3 fields of staked tomatoes in the Burlington district; in one of Earliest of All, it caused 20% loss of crop (W.S. Carpenter). Verticillium wilt sev. affected a tomato crop in a market garden near Charlottetown, P.E.I.; potatoes had been planted in the same field in 1955. The disease is not common in tomatoes (J.E. Campbell, G.W. Ayers).

BACTERIAL SPOT (Xanthomonas vesicatoria). Several reports of the disease were received from the Niagara Peninsula, Ont. In one field adjacent to a planting of peppers, about 20% of the fruit was spotted (J.K. Richardson).

BLACK CORE (? virus). Affected fruits were received from a few canning crops in Essex Co., Ont. An unidentified virus was demonstrated to be present in the blackened tissue (C.D. McKeen).

BROWN WALL (virus) was prevalent in several early fresh fruit crops and in canning crops in s.w. Ont. Juice from affected fruits contained tobacco mosaic virus. The disease was more prevalent than usual (C.D. McKeen).

MOSAIC (virus). Infection from mosaic was very sl. in tomato fields in Okanagan, Thompson and Upper Fraser valleys, B.C., being only 0.1 to 1.0% of the plants (G.E. Woolliams). Few greenhouse crops were free of TMV infection in the Niagara Peninsula, Ont.; a few cases of cucumber mosaic and sl. infections of streak were also noted (J.K. Richardson). Mosaic was observed in some fields in the Toronto-Hamilton area; although rarely sev., one grower lost about an acre of early field tomatoes from mosaic. Cucumber mosaic (shoestring symptoms) was observed on a few plants in about 6 fields; however, in one field about 10% of the plants were affected (W.S. Carpenter). Mosaic sev. affected a 10-acre field of canning tomatoes at St. Denis, Que. (E. Lavallee). All plants in 2 large greenhouses at Kingston, N.S., were affected; growth was good but fruit set was poor (K.A. Harrison).

STREAK (virus). Two major outbreaks of streak were observed during the 1956 season, one near Hornby, Ont., on a field of about 20 acres and another near Port Hope in a 10-acre field. On the assumption that the disease was of the "double virus" type, containing a strain of tobacco mosaic virus and the potato X virus, an attempt was made in each case to trace the disease to its source. The investigation did not suggest any clear-cut answer. However, studies carried out later have indicated that in some cases of streak the aphid-borne potato virus Y was present in the diseased tomatoes; possibly outbreaks of the disease may be correlated with presence of aphids on potatoes and tomatoes grown as companion crops in an area (B.H. MacNeill). A sev. infection of streak was seen in Quebec 13 grown in a greenhouse at Mastai, Que. (D. Leblond).

BLOSSOM-END ROT (nonparasitic) affected 15% of the fruit in a garden plot at Lethbridge, Alta. (M.W. Cormack). Typical specimens were received from several places in Alta. (A.W. Henry, W.P. Campbell). Observed in several gardens in Saskatoon, Sask. (R.J. Ledingham). Reported by a few greenhouse growers in the Niagara Peninsula, but appeared to be less prevalent in the field than usual (J.K. Richardson). The disorder was found in only a few fields in the Toronto-Hamilton area this season (W.A. Carpenter). A few affected fruits were seen at the Botanical Garden, Montreal, Que. (P. Duval). Blossom-end rot affected 3-5% of the fruits of most varieties and 15% of those of Chatham under test at Ste Anne de la Pocatiere (L.J. Coulombe).

CHEMICAL INJURY. Injury from 2,4-D was generally sl. in the Saskatoon area, Sask. in 1956 (R.J. Ledingham). Mod. injury occurred in a planting at Morden, Man. (J.E. Machacek). About a dozen fields of canning

tomatoes in Essex Co., Ont., showed sl.-sev. injury by 2,4-D drift from applications made to the roadside or adjacent crops; both foliage and fruit were affected (C.D. McKeen). About 3 acres of tomatoes was damaged in the Burlington district where the grower used aldrin, 1 pint in 45 gal. in the planting water with 3 lb. of 10-52-17 fertilizer (W.S. Carpenter). Artificial fertilizer applied in the greenhouse at Minto, N.B., burned the plants; when transplanted to the field, crop was delayed but recovered (S.R. Colpitts).

CAT-FACE (nonparasitic) was sev. on fruits of the first picking on Ile Jesus, Que. (E. Lavallee).

DROWNING. Some 25 acres of tomatoes in 2 fields on heavy clay soil n. of Harrow, Ont., were drowned out following a heavy rain of over 3 in. around 10 Aug.; many other cases were also reported from Essex and Kent counties (R.W. Walsh).

FROST INJURY. Temperatures as low as 28°F. ruined about half of the early plantings in the Toronto-Hamilton area, Ont.; about 80% were replaced (W.S. Carpenter).

TURNIP

SOFT ROT (Erwinia carotovora). Various samples of Ont.-grown waxed swedes submitted 14 March showed pockets of rot under the wax; E. carotovora and secondary saprophytes were isolated. Samples of waxed swedes from Tavistock received 9 Nov. exhibited rot; again E. carotovora was isolated (J.A. Carpenter). Mature Laurentian roots were observed infected in the field at several points in Ont.; about 2 acres in a field in Huron Co. was a total loss (J.K. Richardson). Soft rot was observed in 2 fields of Laurentian in Queens Co., P.E.I.; in one where 1% of the roots were decayed, entry was through growth cracks (R.R. Hurst). Soft rot sev. affected 2 carloads of swedes in 2 warehouses at St. John's and one at Clarkes Beach, Nfld. (G.C. Morgan).

BLACK LEG (Phoma lingam). Diseased specimens of swede turnip from Abitibi Co., Que., were received from E. Lavallee; the pathogen was isolated (A.T. Bolton). This fungus caused a very destructive rot in a lot of Laurentian swedes in storage in Queens Co., P.E.I. (R.R. Hurst).

CLUB ROOT (Plasmodiophora brassicae). Diseased specimens were received from Laurierville, St. Nicolas, Neuville and Rouyn, Que. (D. Leblond), and St. Edividge (L. Cinq-Mars). Club root was unusually sev. in swedes in the Pownal and Vernon districts, P.E.I. in 1956. Conditions were favorable for infection in June and early July. A 2-acre field at Pownal was completely

destroyed (G. W. Ayers). Infection was sev. in many garden crops in Conception and Trinity Bays, Nfld., and sl.-mod. in 13 commercial plantings mostly on the West Coast (G. C. Morgan).

SCAB (Streptomyces scabies). An affected swede root was received from Creston, B. C. (G. E. Woolliams). A sl.-mod. infection of scab developed on Laurentian swedes in experimental plots that had been limed to induce brown heart, at Charlottetown, P. E. I. Quicklime was broadcast on the soil at the rate of 1000 lb. per acre (J. E. Campbell).

BLACK ROT (Xanthomonas campestris). Foliage infection, sometimes rather sev. was present in most fields visited in Ont., probably because of weather conditions being favorable for its spread. However, at harvest time it was difficult to find any vascular blackening in the roots. In the dry season of 1955, root symptoms were easy to find (J. K. Richardson). Samples of waxed swedes from Simcoe Co., examined 14 March showed pockets of decay; X. campestris and numerous secondary saprophytes were isolated (J. A. Carpenter). Black rot was observed in 3 fields at Lethbridge, Nfld., destroying 25% of the crop. The crop of one field put in storage, showed 50% of the roots infected in November (G. C. Morgan).

BROWN HEART (boron deficiency) was found affecting a swede root received from Creston, B. C. (G. E. Woolliams). Affected roots were seen in the local market in Quebec City and were received from Pierreville and from St. Laurent, Isle Orleans (D. Leblond).

Brown heart affected 75% of the roots of Laurentian in a plot on sandy soil at Ste Anne de la Pocatiere (R. O. Lachance). Brown heart was sev. in Laurentian grown in plots that received lime at the rate of 1000 lb. per acre and it was mod. in the plots receiving no lime. Soil applications of borate-fertilizer and boron dust applications to the foliage effectively controlled brown heart on both the limed and unlimed soils (J. E. Campbell). Brown heart affected about 5% of the Laurentian roots in the 5 fields inspected in e. Nfld. (G. C. Morgan).

CHEMICAL INJURY Drift from a grain field sprayed to control weeds caused sev. injury to an adjacent 3-acre field of Laurentian swedes at Brackley, P. E. I. (J. E. Campbell).

WATERMELON

ANTHRACNOSE (Colletotrichum lagenarium). A sl. infection was noted on the fruit in a planting at Altona, Man. (J. E. Machacek). Sl.-mod. infection was observed on muskmelon and watermelon in the College plots, Guelph, Ont.; this is the first time a natural infection has been observed in these plots (L. V. Busch).

IV. DISEASES OF FRUIT CROPS

A. POME FRUITS

APPLE

CROWN GALL (Agrobacterium tumefaciens). A preliminary examination of nursery stock of Delicious on E. M. #9 rootstock at Bowmanville, Ont., revealed that a high percentage of the trees were affected by crown gall and hairy root. Three trees from a proposed shipment of 20,000 trees to the United States were sent for examination; diagnosis was confirmed and A. tumefaciens was isolated. (H. N. Racicot, D. S. MacLachlan).

FRUIT ROT (Botrytis cinerea). Two apples were found infected in the orchard of the Exp. Farm, Kentville, N. S.; several severe frosts had already occurred (C. O. Gourley).

FIRE BLIGHT (Erwinia amylovora) was unusually sev. and widespread on apple and crabapple in Edmonton, Alta. (L. E. Tyner, W. P. Campbell). Specimens also received from Three Hills and Beverley (A. W. Henry). Fire blight was rather common on apple and crabapple around Saskatoon, Sask., in 1956. Specimens were also received from 4 widely separated points in Sask. (R. J. Ledingham). The most sev. epidemic of fire blight since that in 1941 occurred at the Exp. Farm, Morden, Man. No attempt to control the disease was made in the spring of 1956 following the apparent failure of a late spraying program in the springs of 1954 and 1955. Cankers of all sizes were abundant in the orchard in the fall of 1956. Mod. infections were general in the Winnipeg area. Requests for control methods were frequent (W. C. McDonald). Fire blight seemed more prevalent than usual in the London-St. Thomas area, Ont., on apples and pears. Infected blossoms and twigs were seen on McIntosh, Jonathon, Northern Spy, Tolman Sweet, and on some early varieties, such as Early Harvest and Astrachan. Infection was generally sl. but in two orchards there were also half a dozen trees sev. affected (W. S. Babbitt). The occurrence of fire blight was confirmed by isolations from specimens received from Mr. Babbitt. Sl. infections were also reported by B. J. Teskey supported by specimens from two Northern Spy orchards in the Collingwood and Meaford districts respectively (J. H. Carpenter). Fire blight was less sev. in the Hemmingford-Franklin district, Que., than in 1955. There was little spread. A sl. infection occurred on single trees of Fameuse and McIntosh in 2 orchards at St. Chrysostome and St. Gregoire respectively (R. Crete). A few twigs were infected on most of the McIntosh trees in an orchard at St. Hubert (L. J. Coulombe).

RUST (Gymnosporangium clavipes) was not prevalent in commercial orchards in Kings Co., N. S.; about 1% of the fruit was affected. A few aecial pustules were noted on a scab-resistant seedling (J. F. Hockey).

ANTHRACNOSE (Neofabraea malicorticis) was found on several trees in Vancouver, B.C., some were nearly destroyed (W.R. Foster).

PERENNIAL CANKER (Neofabraea perennans). Existing cankers showed appreciable enlargement in May and June on Newton in the Okanagan Valley, B.C. This enlargement is believed to be the result of tree damage by the low winter temperatures in 1955 (D.L. McIntosh).

BLUE-MOLD ROT (Penecillium expansum) was heavy in Toronto-Hamilton area, Ont., in two lots of Delicious in the same storage, but not in other growers' containers. These lots apparently were left in the orchard exposed to rain over a week-end before storing (W.S. Carpenter).

FROG-EYE SPOT (Phyllosticta limitata). A scattered infection occurred on leaves of Northern Spy received from Simcoe, Ont. (G.C. Chamberlain).

BLACK ROT (Physalospora obtusa). Sepal infections caused calyx-end injury in a tr.-1% of the Cortland apples in all blocks in a spray-test orchard at Cambridge, N.S.; leaf spot was also present in small amounts (J.F. Hockey). A sl. infection was seen in young trees at St. Gregoire, Que. (R. Crete).

POWDERY MILDEW (Podosphaera leucotricha) was almost absent in apple orchards of the B.C. Interior in 1956. Buds harboring the mycelium were nearly all killed during the severe winter of 1955 (D.L. McIntosh). Powdery mildew was prevalent in two orchards in Essex Co. Ont.; both orchards had been sprayed with organic fungicides only for the last four seasons. Jonathan was the most sev. affected (R.W. Walsh). Powdery mildew was prevalent and caused considerable damage to McIntosh in the laboratory orchard, St. Catharines, Ont. (G.C. Chamberlain). Although powdery mildew was previously noticed in nurseries in the Toronto-Hamilton area in which sl. infections were again present this year, the first sev. orchard infection was noted at Agincourt on Cortland after glyodin was used for two years (W.S. Carpenter).

SCLEROTINIA ROT (S. sclerotiorum). Shallow lesions at the calyx end occurred on a few McIntosh apples at Coldbrook, N.S., apparently following sepal infections (J.F. Hockey).

SCAB (Venturia inaequalis) was sev. on one tree of Delicious at Agassiz, B.C.; the disease was also present on Hyslop crab and several ornamental crabs (H.N.W. Toms). Losses from scab were exceptionally light in the B.C. Interior in 1956; warm dry weather prevailed for most of the growing season (D.L. McIntosh). Sl. infections were observed in two gardens in Saskatoon, Sask. (R.J. Ledingham). Infection was mod. in the Exp. Farm orchard, Morden, Man. and sl. in the Univ. orchard, Fort Garry (W.C. McDonald).

Reports indicate that scab was fairly well controlled by the spray schedules now followed in commercial orchards in Ont. Unsprayed trees in the laboratory orchards at St. Catharines were heavily infected, the crop reduced and the fruit small and 99.6% scabbed. In the sprayed blocks, scab at harvest affected 0.8-80.2%, average 13%, of the fruits. Late season scab on the fruit was considerable in some treatments. Ascospore discharge first occurred during a 72-hour wet period, 27-29 April, when apple buds were in the green tip stage. Primary scab lesions were first observed on 21 May. Secondary lesions were present on 4 June and infections on the fruit were present on unsprayed trees on 8 June (G.C. Chamberlain). In the Toronto-Hamilton area primary infection occurred on 10, 12 and 13 May and scab first appeared on the leaves 26 May. An infection period 29 May caused some sepal infection. Mercurials alone or in combination were extensively used in the pre-cover sprays; most growers harvested a fairly clean crop. Captan gave relatively clean crops. In two orchards where Colsul sulphur paste 10-12 lb. was used in the pre-cover sprays it gave poor control although applications were well timed while some others were relatively clean. Considerable pin-point scab developed in orchard and storage as a result of a wet August and September (W S. Carpenter). Scab was again a problem in the London-St. Thomas area in ineffectively sprayed orchards, although it was shown that a satisfactory program would keep scab in check even in a wet year such as 1956. Eradicant sprays when used in combination with a protectant program proved their value. Less than 1% fruit scab was found in orchards where a wide variety of materials, including sulphur, captan and glydoin were used, as long as they were applied with an eradicant and correctly timed (W.S. Babbitt). In s.w. Que. conditions were favorable for scab in 1956. Over three inches of rain fell each month from May to July. Long infection periods occurred on 27-28 May at the pre-pink stage and 27-28 June during cover applications. Unsprayed orchards were plastered with scab on both fruit and foliage. Pedicel and sepal infections were heavy during the earlier infection period and as a result there was a high percentage of scabby apples on the ground later in the season in infected orchards. Despite favorable conditions for scab, most orchards were kept free of scab by frequent well-timed fungicide applications. Some late pin-point scab developed where fungicides other than ferbam were used in the cover sprays or late applications were omitted when there were traces of scab in the orchard (L. Cinq-Mars). A sl. infection was seen at St. Prime and Albanel, Roberval Co. where only a few trees are grown and at Chicoutimi, Kamouraska Co., on unsprayed orchards (H. Genereux). Scab caused partial defoliation and total loss of fruit on one crab apple tree in a garden at Gaspe (H.N. Racicot).

Apple scab was sev. this year in N.B., especially in poorly sprayed orchards. When fungicides were applied by the conventional spraying machines, scab affected 30-35% of the crop. Only those orchards using air-blast sprayers were comparatively free of scab. Primary discharge of ascospores took place on 3 May and subsequent cool showery weather throughout the season favored the spread of scab (J.L. Howatt).

Apple scab was late in developing in N.S. in 1956. There were 1 mod. and 3 light infection periods before bloom and 4 sev., 3 mod. and one light one in the 8 weeks after bloom. The use of eradicants has reduced the number of applications necessary to control the disease (J. F. Hockey). Scab presented more of a problem in 1956 in P.E.I. than in any recent year. Infection periods were frequent and unsprayed and poorly sprayed orchards suffered sev. damage. In one orchard where Kolo 100 was applied in seven applications, poor timing or poor coverage resulted in a very scabby crop (J.E. Campbell).

COLLAR ROT (cause undetermined) was found in several orchards of Northern Spy about Thornbury, Ont. Many mature trees were seen with extensive injury to the crown and extending into the heavy roots. The injury is believed to have started in the fall of 1954 and progressed until some trees are being girdled in 1956 (G.C. Chamberlain). Reports of collar rot, particularly on Northern Spy, have been increasing in the last two years in the Toronto-Hamilton area. Possibly injuries to the crown from an early November frost in 1953 and from hurricane Hazel in 1954 are now becoming evident. There appears to be no correlation between drainage and soil conditions and location of the affected trees (W.S. Carpenter).

LEAF PUCKER (virus). This new disease was first seen in two McIntosh trees at Summerland in 1954. The principal symptoms are a puckering and dwarfing of the leaves accompanied by bright yellow irregular blotches and flecks. These symptoms are exhibited only by leaves formed early in the season. Affected trees bear fruits with irregular depressions, which are usually russetted. The virus was successfully transmitted by spring grafting in 1955, foliage symptoms resulting in the summer of 1956 on McIntosh and Spartan, but not on Jonathan and Winesap. Test trees have not yet fruited (M.F. Welch, F.W.A. Keane).

'PITTING'. Although no additional information has been received concerning the occurrence of this disease in the Okanagan Valley, B.C., (P.D.S. 35:102) a similar "incompatibility" has been observed at Ste. Clothilde, Que. H.W. Guengerich and D.F. Millikan (Plant Dis. Reptr. 40:934-938. Nov. 15, 1956) have also presented evidence of its transmission by grafting. The evidence suggests that the disease is caused by a virus (I.L.C.).

CHLORORIS (Nitrogen deficiency). A case of nitrogen deficiency in the McIntosh trees growing at Pickering, Ont., was diagnosed from leaf samples (H. Hill, H.N. Racicot).

HAIL INJURY ? A small percentage of Yellow Transparent apples shipped from Kelowna, B.C. show small injuries, mostly on one side, which did not resemble insect injury and were free from micro-organisms (H.N. Racicot).

MUMPS (cause unknown) was found on Winesap in several orchards in the Similkameen Valley and in three in the Okanagan Valley, B.C. Swellings occur usually at base of watersprouts and around pruning wounds and sometimes at other points on lateral branches. Tissues are soft and appear to be very susceptible to winter injury, resulting in the formation of cankers. Damage is sl. on older trees, but it may be so sev. on young trees that they have become worthless. No evident correlation found with the nutrition of the trees; transmission experiments undertaken in 1956. Mild symptoms were observed in Golden Delicious topworked on affected Winesap (M.F.W., F.W.A.K.).

PURPLE BLOTCH (cause unknown) was first observed in orchards of Red Stayman at Westbank, B.C.; in one, one-third of the trees and in two others scattered trees were affected. Large irregular purple blotches become very evident about a month before picking, but flesh below is unaltered. Often the blotch is confined to certain limbs of affected trees. Transmission experiments undertaken in 1956 (M.F.W., F.W.A.K.).

SPRAY INJURY. Glyodin-lead arsenate injury was less apparent in the Toronto-Hamilton area, Ont., than in previous years, possibly because frequent rains did not permit a build-up of lead. Captan injury was found in two Delicious and one Melba block on a full schedule. In one orchard where captan injury showed on McIntosh foliage when used in the calyx spray for two years, ferbam was substituted at the calyx spray and no injury was seen. Parathion-mercurial combination sprays caused sev. injury at the pink stage to McIntosh, Delicious and Northern Spy when the spray was allowed to stand in the tank overnight before applying; sl. injury occurred when it was applied immediately. Full strength mercurial plus Colsul sulphur applied to Delicious in full bloom during cool cloudy periods following rain sev. reduced fruit set in Delicious, but only sl. on McIntosh and Northern Spy (W.S. Carpenter).

STIPPIN (physiological) affected the entire crop on one Delicious tree in an orchard at Port Dalhousie, Ont. (G.C. Chamberlain).

FROST INJURY. Low temperatures, as low as 23°F in some localities in the Toronto-Hamilton area, Ont., on 24 May when early varieties were in bloom, caused reduction of crop from 10% on the lower limbs to 40% of the total crop on trees in frost pockets. Frost rings were noticeable on many fruits at harvest. A temperature of 25°F. appeared to cause no damage in certain localities (W.S. Carpenter).

PEAR

FIRE BLIGHT (Erwinia amylovora) was more prevalent in the B.C. Interior than in 1955, but it was not present in epidemic proportions. Twig

and branch infections, chiefly on Bartlett, were common in many Okanagan and Kootenay orchards (D. L. McIntosh). A 5-acre orchard at Belle River, Ont., was pulled out after most trees were infected; old cankers had not been properly treated and the orchard had a continuous history of fire blight (R. W. Walsh).

The worst outbreak of fire blight in several years occurred in the Niagara Peninsula. Often 2-3 shoots per tree were infected and damage to twigs and spurs was reported from many orchards, mostly Bartlett. The disease was common even where cultural practices had not changed for many years (G. W. Eaton).

Infection in the trunk and larger branches of Clapp's Favorite was observed in an orchard at Port Dalhousie; active cankers were present. Bosc and Anjou varieties were also sl. affected (G. C. Chamberlain). Fire blight caused great damage in 3 orchards on Bartlett and Flemish Beauty in the Toronto-Hamilton area. Temperatures were around 60°F. during bloom with intermittant rain. The initial infection was then spread by further rains during the summer. Continued removal of infections reduced some trees to stumps (W. S. Carpenter).

SOOTY BLOTCH (Leptothyrium pomi). Heavily infected Kieffer pears were received from Vineland, Ont.; the disease was reported to be quite prevalent in the district (G. C. Chamberlain). A few complaints of sooty blotch on Bartlett and Kieffer pears were received from the Toronto-Hamilton area; the disease has not been apparent recently (W. S. Carpenter). Sooty blotch was rather sev. in several orchards on Kieffer in the London-St. Thomas area (W. S. Babbitt).

LEAF SPOT (Septoria pyricola) was conspicuous on Bartlett leaves received from Simcoe, Ont. (G. C. Chamberlain).

SCAB (Venturia pirina) affected 90% of the Flemish Beauty fruit in an orchard nr. Winona, Ont. where these trees are interplanted between Bartlett for pollination; Bartlett was not affected (G. W. Eaton). In an orchard at Port Dalhousie 20% of the Bartlett fruit were unmarketable on account of scab (G. C. Chamberlain). Two growers in the Toronto-Hamilton area suddenly found at harvest that not only their Flemish Beauty but also the Bartlett pears were affected by scab (W. S. Carpenter). A single sev. affected fruit was received from Stratford (H. N. Racicot). A sl. infection occurred on the foliage of a few pear trees in an orchard at Dunham, Que. (L. Cinq-Mars).

STONY PIT (virus). At Summerland, B. C., Bosc trees known to be affected with stony pit and Flemish Beauty suspected of being infected showed no recognizable symptoms; apparently lack of symptoms was an effect of the weather condition this year (M. F. Welsh, F. W. A. Keane). Two Anjou trees in a block of ten trees in the laboratory orchard, St. Catharines, Ont. produced a worthless crop on account of stony pit (G. C. Chamberlain).

B. STONE FRUITS

APRICOT

BLACK KNOT (Dibotryon morbosum). One knot was found in a planting of young apricot trees at the Exp. Farm, Kentville, N.S. (C.O. Gourley).

BLOSSOM AND TWIG BLIGHT (Monilinia fructicola). Blossom blight was prevalent and sev. on apricots in an orchard at Beamsville, Ont. Later it advanced into the twigs causing twig cankers and die-back (G. C. Chamberlain). All the blossoms in one orchard and on several isolated trees in others were blighted nr. Vineland (G. W. Eaton).

RING POX (virus). No spread of ring pox was observed in six apricot orchards in the Okanagan Valley where the disease had been previously noted, but it was recorded for the first time in a Penticton orchard. The occurrence of ring pox on apricot is frequently correlated with that of twisted leaf on cherry. However, there are no cherry trees near the diseased apricots at Penticton (T. B. Lott).

CHERRY

BLACK KNOT (Dibotryon morbosum). A single affected Prunus pensylvanica was found among the pin cherries growing along the river bank at Edmonton, Alta. (W. P. Campbell). Affected sour cherries were received from Isle Vert and St. Michel de Bellclose, Que. (D. Leblond).

LEAF SPOT (Higginsia hiemalis) was very prevalent in the latter part of the season in many orchards in the Niagara Peninsula, Ont. and premature defoliation was serious. A few primary infections were noted on 21 June on sour cherry at Burlington. Mod. infected leaves were received 27 July from Collingwood and sev. outbreaks were reported from Prince Edward Co. (G. C. Chamberlain).

Leaf spot caused mod.-sev. defoliation in most sour cherry orchards in the London-St. Thomas area; some growers failed to apply a post-harvest spray (W. S. Babbitt). Although sev. infection occurred throughout the Toronto-Hamilton area and some orchards were defoliated by late September, where the foliage was kept thoroughly covered and additional sprays were applied before and after harvest, control of the disease was significantly improved (W. S. Carpenter). Leaf spot had already caused 5% defoliation by 30 July in a young non-bearing orchard of sour cherries at Tupperville, N.S.; the trees were not receiving a full spray schedule (C.O. Gourley).

BROWN ROT (Monilinia fructicola). Losses from brown rot in Bing and Lambert cherries was very heavy in 1956 in several districts in the Kootenays, B.C. (D.L. McIntosh). Blossom blight was common on cherry and peach and very serious on apricots in the Niagara Peninsula, Ont. Sweet cherries were commonly infected by brown rot, and the disease was serious in early varieties of peaches. Later varieties ripened more slowly as a result of cool weather and brown rot appeared to spread rather slowly. Many mummied fruits with numerous sporodochia are present on the trees (G.W. Eaton). Brown rot affected 75% of the sweet cherry fruits in a closely planted orchard at Port Dalhousie, Ont. Trees were fully leaved and air drainage was poor (G.C. Chamberlain). Tr. infection was observed on both sweet and sour cherries at the Exp. Farm, Kentville, N.S. (C.O. Gourley).

DECLINE (Paratylenchus sp.). In an orchard about 20 years old at Vineland, Ont., the trees have been declining in vigor in recent years, leaves are smaller and the entire orchard will have to be replaced (J.L. Townshend).

POWDERY MILDEW (Podosphaera oxyacanthae) was common in nursery plantings of Montmorency cherry about St. Catharines, Ont.; causing mod. stunting of the terminal leaves. It was also reported to have been heavy in commercial orchards of Montmorency in Prince Edward Co. (G.C. Chamberlain). Powdery mildew has gradually become sev. in one Montmorency orchard where glyodin has been the fungicide for several years (W.S. Carpenter). A mod. infection was noted on young sour cherry trees in a nursery at Ste Anne de la Pocatiere, Que. (J. Ringuet).

LITTLE CHERRY (virus). Symptoms of little cherry were milder in the Kootenays, B.C., especially in the Creston Valley, than in any season since 1950. A large percentage of the fruits on diseased trees attained the size and color required for No. 1 cherries. It may be of some significance that the 1950 and 1956 seasons followed very severe winters (J.M. Wilks).

RASP LEAF (virus) sev. affected one sweet cherry tree in an orchard nr. Winona, Ont.; symptom expression was most striking (G.W. Eaton).

YELLOWS (virus). The development of the yellow leaf symptom with leaf drop, which is characteristic of yellows is dependent on weather conditions. Because the spring of 1956 was late, temperatures during March and April being low, yellows symptoms did not develop to any appreciable extent on the Niagara Peninsula, Ont. No tree was seen with more than a few leaves yellowed (T.R. Davidson).

FROST INJURY. Temperatures as low as 23°F. on 24 May destroyed 25-75% of the crop on the lower limbs and occasionally 60% of the entire crop in sour cherry orchards in the Toronto-Hamilton area, Ont. (W.S. Carpenter).

NITER BURN. A spring application of cyanamid caused marginal burning and yellowing of leaves with almost complete defoliation of some trees in a Montmorency orchard at St. Catharines, Ont. (G. C. Chamberlain).

PEACH

DIE-BACK (Cytospora leucostoma). A tr. was present on new wood of Early Red Fré trees at Grand Pré, N.S. (C.O. Gourley).

BLACK KNOT (Dibotryon morbosum). Only 3-4 infections, which were bearing the imperfect state of the fungus, were found 2 Aug. on trees at Grand Pré, N.S. On 17 May the perfect state was found on 10 knots in 2 orchards at Grand Pré. The knots were completely parasitized and no ascospores were observed (C.O.G.).

SCAB (Fusicladium carpophilum) was heavy in an orchard nr. Hamilton, Ont. 60-95% of the fruit being affected on one variety. Cankers were also present on the twigs. About 5% of the affected fruit were also affected by Coryneum Blight (Clasterosporium carpophilum) (G. W. Eaton). In any orchard in the London-St. Thomas area, failure of the sprayer resulted in the crop being poorly protected; scab was serious, 5-15% of fruit surface being covered by scab lesions (W.S. Babbitt). Tr. was present on peaches at Grand Pré, N.S. (C.O. Gourley).

BLOSSOM BLIGHT AND BROWN ROT (Monilinia fructicola). Blossom blight was more prevalent than usual in the Niagara Peninsula, Ont. In one orchard in Lincoln Co., 80-90% of the blossoms of Marigold were blighted; the infection was also moving into the twigs causing cankers and die-back. Brown rot caused considerable loss of harvest fruit in the midseason varieties. Fruit from the laboratory orchard after a period in common storage developed brown rot as follows:-

Treatment	After 2 days	After 6 days
Check	36.8	78.5
Captan	6.7	44.7
Thioneb	12.8	55.0
Sulphur	6.7	38.2

Brown rot was sev. in the London-St. Thomas area on account of continued rainy weather especially the last 2 weeks in August. Growers sprayed and dusted more frequently than usual and still did not get effective control (W.S. Babbitt).

A tr. of brown rot was present on all varieties and seedlings being grown about Grand Pré, Berwick and Annapolis, N.S. (C.O. Gourley).

REPLANT INJURY (Pratylenchus penetrans). Red Haven trees planted to replace failures on a knoll in an orchard at Grimsby Beach, Ont., are now unthrifty or dying after 2 years and will have to be replaced a second time (J. L. Townshend).

LEAF CURL (Taphrina deformans) was reported to be sev. on unsprayed trees by several home gardeners about Vancouver, B. C. Infection was mod.-sev. on six trees in the University orchard although a dormant spray had been applied (H. N. W. Toms). A very sl. infection occurred at Creston, B. C. (J. M. Wilks). Scattered infection occurred in many orchards in the Niagara Peninsula, Ont. First infections observed at St. Catharines on 22 May. On unsprayed trees 35% of the terminal growth was infected (G. C. Chamberlain). A sev. infection was seen on young trees in an unsprayed orchard at Niagara (G. W. Eaton). Leaf curl affected 1% of the foliage in peach orchards in King's and Annapolis Counties, N. S. (C. O. Gourley).

VERTICILLIUM WILT (V. albo-atrum) affected a single 2-year old tree in a block of 80 Jubilee trees at Virgil, Ont. (G. C. Chamberlain).

BACTERIAL SPOT (Xanthomonas pruni) became established in the variety orchard at Harrow in 1950, was epidemic in 1952 and was almost absent in 1953 and 1954. It may have been present earlier but was mistaken for arsenical injury in 1953 and 1954. In the variety orchard varieties have been found to vary widely in their susceptibility to the disease under natural conditions. Of the four most commonly grown varieties in s.w. Ont., Golden Jubilee appeared to be free from infection, Elberta was very sl. susceptible, Halehaven sl. susceptible and Redhaven mod. susceptible. The disease has a weakening effect on the tree and the fruit of some varieties are sufficiently injured to be unmarketable. Bacterial spot has not been controlled effectively at Harrow by the means usually recommended. Streptomycin A, 100 ppm., at the shuck split, shuck fall and first cover did not reduce infection in the very susceptible July Elberta. Bacterial spot was not present in the Harrow orchard in 1956 but was present in the occasional orchard of Redhaven in the district (T. B. Harrison).

WESTERN X-DISEASE (virus) was found on six affected trees in one orchard and scattered trees in neighboring orchards at Oliver, B. C. The orchards checked were known to have a history of western X-disease but no symptoms were present in the last several cool summers even on trees known to be infected until 1956 when symptoms were again apparent (M. F. Welsh, W. H. A. Wilde).

CROWN ROT. About 200 trees in an orchard of 1500 trees, 16-18 years old, were sev. affected by crown rot at Niagara-on-the-Lake, Ont. Many trees failed to bud out and others showed some growth but later wilted and died back. The area is flat and poorly drained. As a result of a very wet fall in

1955, trees failed to properly mature and suffered winter injury (G. C. Chamberlain).

WINTER INJURY. Peach, apricot and sweet cherry trees and forsythia, rose of sharon, and mountain ash in home gardens on heavier soils suffered considerable injury or were killed in Essex Co., Ont. as a result of a sudden drop of the temperature to 10°F. on 10 Nov. 1955 (R. W. Walsh).

PLUM

BLACK KNOT (Dibotryon morbosum). The scaffold limbs of about 40 out of 50 young Fellenburg trees were affected by knot in an orchard nr. Vineland, Ont.; the affected trees are useless (G. W. Eaton). Diseased specimens were received from St. Cesaire, Que. (D. Leblond). The disease is common on native plum and cherry in the Montreal district (P. Duval). Black knot was present on uncared-for plum trees in a back yard at Kentville, N.S. (C. O. Gourley). Black knot destroyed plum and cherry trees in a home garden at Springfield, P.E.I. Wild cherry trees in the neighborhood of the garden were also sev. attacked. Except to prune out dead branches, no effort was made to control the disease (J. E. Campbell).

SCAB (Fusicladium carpophilum). A tr. was present on fruit of P. ?nigra received from Carleton Place, Ont. (H. N. Racicot). Diseased fruit were received from L'Alverne, Bonaventure Co., Que. (D. Leblond).

BROWN ROT (Monilinia fructicola). Decayed fruit were received from Douglastown, Gaspe Co., Que. (D. L.).

PLUM POCKETS (Taphrina communis). Specimens were received from New Liskeard, Ont.; first noticed about 2-3 years ago (H. N. R.). Specimens received from three widely separated places in Que. (D. L.). A sl. infection was noted on Burbank plum at the Exp. Farm, Kentville, N.S. (C.O G.).

BACTERIAL SPOT (Xanthomonas pruni) affected 75% of the fruit on a few Climax trees at Beamsville, Ont. (G. C. Chamberlain). In an orchard near Winona, where the Japanese plum, Climax, was grafted on the centers of European plum trees, the Climax fruit were worthless on account of bacterial spot while the European plums were completely free of the disease (G. W. Eaton).

PRUNE DWARF (virus). No spread of this virus disease has been observed on the Burbank plum at Kentville, N.S. (C. O. Gourley).

HEAT OR DROUGHT SPOT (physiological) was common in many orchards of Fellenburg prune in the Niagara Peninsula, Ont. and almost the whole crop

was affected in several. The fruits show a purple water-soaked area with tendrils of gum exudate from the spots. Pacific prune showed extensive deep cracks on the fruit while Stanley prune was not affected (G.C. Chamberlain). Drought spot, or gum pockets, was present on many European varieties of plums and prunes in the Toronto-Hamilton area (W.S. Carpenter).

C. RIBES FRUITS

CURRANT

WHITE PINE BLISTER RUST (Cronartium ribicola) was prevalent late in the season on black currants in the University garden, Winnipeg, Man. (B. Peturson). A mod. infection occurred on a red currant bush and a scattered infection on wild Ribes at Clearwater Bay, Ont. (W.L. Gordon). The rust was heavy on red currant leaves received from Bath (G.C. Chamberlain). Infection was heavy on black currants in a nursery at St. Bruno, Que. (J. Ringuet), and mod. on red currant in the Agr. School orchard at Ste Anne de la Pocatiere (D. Leblond).

ANTHRACNOSE (Drepanopeziza ribis) was seen on Ribes alpinum in two nurseries nr. Montreal, Que., causing heavy spotting of foliage and some early defoliation (J. Ringuet); the conidial state was present on the specimen received (DAOM 54679) (R.A. Shoemaker). A tr. was present on red currant at the Farm, Kentville, N.S. (KP2311) (C.O. Gourley).

POWDERY MILDEW (Sphaerotheca mors-uvae). A sev. infection was noted late in the season in several plantings at Lethbridge, Alta. (F.R. Harper). Mod. infected specimens of black currant were received from Scarborough, Ont. (H.N. Racicot). Affected specimens received from St. Romuald, Levis Co., Que. (D.L.). Powdery mildew caused loss of 10% of the fruit of White Smith at Waterville, N.S.; infection was less sev. than in 1955. Karathane applied as a spray to susceptible varieties of currants and gooseberries gave almost complete control of the disease (C.O.G.).

GOOSEBERRY

RUST (Puccinia caricina) was found on a species of Carex nr. Thorhild, Alta.; aecia were present on a nearby group of wild gooseberries (W.P. Campbell). The cluster cup stage was mod.-sev. on gooseberries being grown at the School, Ste Anne de la Pocatiere, Que. (D. Leblond). A tr. was present at the Farm, Kentville, N.S. (C.O. Gourley).

D. RUBUS FRUITS

RASPBERRY

CROWN GALL (Agrobacterium tumefaciens). An occasional plant was sev. infected in an old Viking planting in Queen's Co., P.E.I. (R.R. Hurst). The disease was also causing considerable damage in another planting in Queen's Co.; canes noticeably stunted, galls present on the roots, which were also hairy (J.E. Campbell).

SPUR BLIGHT (Didymella applanata). Affected specimens received from Rosthern, Sask. (T.C. Vanterpool). Sev. diseased specimens received from Matheson, Ont.; plants were reported showing die-back symptoms (H.N. Racicot). Spur blight was noted in several garden patches and in a few commercial plantings not being regularly sprayed in the Toronto-Hamilton area (W.S. Carpenter). A mod.-sev. infection was present in Newburg at Ste Foy, Que. this fall. Diseased specimens were also received from St. Michel de Bellechase and Drummondville (D. Leblond). A sev. outbreak of spur blight occurred on new canes on several patches in the Annapolis Valley, N.S. (K.A. Harrison). Infection was: Viking, tr.; Rideau, mod.; and Madawaska, sev. at the Farm, Charlottetown, P.E.I. (R.R. Hurst).

ANTHRACNOSE (Elsinoe veneta). Mod. infection in a planting at Brandon, Man. (J.E. Machacek). The most sev. outbreak of anthracnose in some years occurred in s.w. Ont. this year. In an 18-acre planting many leaves were turning yellow and dropping on 14 June on account of peticle lesions. Lesions were numerous on the new shoots (R.W. Walsh). Anthracnose was very common in the Niagara Peninsula causing infection on cane, leaf, petiole, peduncle and fruit. In a planting of Taylor at St. Catharines, sev. infection on new cane growth caused die-back and cessation of growth. Because of much late season infection the spray program only effectively controlled the disease on the lower part of the canes. Infected fruit specimens were received also from the London and Guelph area (G.C. Chamberlain). Anthracnose and spur blight were prevalent in raspberry plantings in the London-St. Thomas area; although these plantings are not extensive, the yield was materially reduced (W.S. Babbitt). Anthracnose was sev. in plantings about Huttonville, Clarkson and Waterdown and also in garden patches over a greater area; no spray program followed (W.S. Carpenter). Diseased specimens were received from Levis (D. Leblond). Anthracnose has infected a planting of Madawaska at Jemseg, N.B. for several years and no crop has been harvested in the last two; no control measures have been applied (S.R. Colpitts). Anthracnose has been sev. in small areas in N.S. and has caused some loss of fruit. Affected fruit have been received from Amherst, Hantsport and Kentville (C.O. Gourley). Heavily infected specimens were received from Prince Co. P.E.I. (R.R. Hurst).

CANE BLIGHT (Leptosphaeria coniothyrium). Sev. infection was noted in 2 plantings at Swan River, Man. (W.L. Gordon). The disease was heavy on several varieties in the plots at the Farm, Charlottetown, P.E.I. (R.R. Hurst).

YELLOW RUST (Phragmidium rubi-idaei) was observed on Washington in the Abbotsford area, B.C. Infection was sl. this year and no enquiries about the yellow aecial stage were received. Infection from overwintering telia was sl.-mod. on new canes but without any defoliation (H.N.W. Toms). Diseased specimens were received 17 Sept. from Ste Angele de Laval, Que. (D. Leblond).

LATE LEAF RUST (Pucciniastrum americanum). A fairly heavy infection was present on Viking on 1 Aug. nr. Winona, Ont.; damage was negligible (G.W. Eaton). A sl. infection was noted in 4 nurseries in Que. in the early fall (J. Ringuet). This rust was observed on Viking, Newburg and Indian Summer at Berwick, causing sl. defoliation; infection was less sev. than in 1955 (C.O. Gourley). A light infection developed late in the season on raspberry nursery stock in P.E.I. (J.E. Campbell).

LEAF SPOT (Septoria rubi) caused 10% defoliation on Trent at Berwick, N.S.; it was also observed at Melvern Square (C.O. Gourley). Leaf spot infection on raspberries at the Exp. Farm, Charlottetown, P.E.I. was: Trent, sev.; Washington 0-273 and Marcy, heavy; and Tweed, none (R.R. Hurst).

POWDERY MILDEW (Sphaerotheca humuli) mod. affected several small plantings in the Toronto-Hamilton area, Ont. (W.S. Carpenter). Infection was rather sev. on Latham (3 acres) whereas Viking (3 acres) and Newburg (1 acre) showed no infection in a nursery at Abbotsford, Que. (J. Ringuet).

WILT (Verticillium albo-atrum) affected about 35% of the plants in a 1/2-acre planting at Rougemont, Que.; the plants came from another planting that had shown the same symptoms in previous years (L. Cinq-Mars). Wilt affected about 10% of the canes in a new garden planting at Wolfville, N.S.; the land had previously been cropped to potatoes for several years (C.O. Gourley).

LEAF CURL (virus) was prevalent in garden patches at Saskatoon, Sask. in 1 garden only 3 years old. 90% of the plants were affected (T.C. Vanterpool). A few affected plants seen in a Viking planting at St. Catharines, Ont.; diseased Taylor canes sent in from Toronto (G.C. Chamberlain). A single plant of each variety was infected in a large commercial planting of Viking and Taylor at Berwick, N.S. (C.O.G.).

MOSAIC (virus). A sev. infection was seen in a planting at Brandon, Man. (J.E. Machacek). Some mosaic occurs in a number of the old, poorly-cared-for plantings in the Toronto-Hamilton area, Ont.; occasionally a low

percentage of plants is infected in plantings of the better growers (W.S. Carpenter). Infection was tr.-2% in 12/37 raspberry nurseries inspected in 1956. (J. Ringuet). Traces of mosaic were noted in plantings at Berwick and Melvern Square, N.S. (C.O. Gourley). A diseased specimen was received from Montague, P.E.I. (J.E. Campbell).

A special survey of raspberry plantations in Ontario was conducted by Dr. A.T. Bolton; the results are reported below:

Survey of Raspberry Plantations in Ontario

Some 400 acres of raspberries were examined in the major raspberry-growing localities in Ontario. This acreage was scattered through 50 townships in 23 counties, about 3 plantations, each some 1-3 acres in extent, were examined in each township. As many letters and samples of anthracnose-infected canes had been received from growers throughout the province, an attempt was made to estimate the damage caused by the disease. Because this survey was made after harvesting was complete it was necessary to obtain the grower's own estimates of the reduction in yield caused by the diseases. In many districts anthracnose became severe on the fruiting spurs during the final 10 days of harvesting and caused many of the immature fruits to dry and wither. Many growers reported that spots appeared on the fruits themselves as well as on the canes. Many of the samples sent in to the laboratory contained spotted and dried fruits. These spots on the fruits were also found on Tweed, Trent, and Madawaska raspberries in experimental plots at Ottawa, and the anthracnose organism was isolated from them. This direct attack upon the fruits themselves is quite uncommon even on the most susceptible varieties. In some plantations, however, the disease appeared after fruiting, and no direct reduction in yield was encountered. In all plantations examined, the disease was present, in various degrees of severity, on the new canes.

The percentage of new canes that were sev. infected (i.e. completely girdled by lesions) varied from about 40% to 100% and averaged about 70%. The estimated loss in yield varied from 5% to 60% and averaged 23.5%. As might be expected estimates of reduction in yield made by the growers themselves varied considerably. However, most growers estimated a considerable decrease and in most plantations where the estimated loss was high the infection on the new canes was very sev. The observations indicate that an effective spray program must be developed to control outbreaks of anthracnose such as occurred this year. The loss in yield is only a part of the damage caused by the disease for it is almost a certainty that a large percentage of the infected new canes will be lost as a result of winter killing.

E. OTHER FRUITS

BLUEBERRY

TWIG AND BLOSSOM BLIGHT (Botrytis cinerea and Monilinia vaccinii-corymbosi). A survey of 39 fields of low bush blueberry in Charlotte Co., N.B., in June revealed that 7 (17.8%) were infected by B. cinerea and 34 (87%) by M. vaccinii-corymbosi. The loss of crop caused by the two fungi was estimated to be 5 and 20% of the crop respectively. Culture studies on blighted twigs and blossoms from 5 fields showed 3-44% of the lesions were caused by Botrytis and 50-92% by Monilinia. In a similar survey of 23 fields in Cumberland Co., N.S. 3 were infected by Botrytis with 3% av. infection and 13 by Monilinia with individual fields showing up to 75% infection. Blighted twigs from affected fields in Kings Co., N.S. yielded 3-22% Botrytis and 50-77% Monilinia. Blossom and twig blight also occurred in the fields of high bush blueberry at Aylesford, N.S., but the level of infection was considerably less than in the low bush blueberry. B. cinerea also caused about 2% of berry rot in the Aylesford fields (C.L. Lockhart).

WITCHES' BROOM (Calyptospora goeppertiana). Several sev. affected specimens of V. vitis-idaea were found at Musquodoboit Harbour, N.S. (J.F. Hockey).

RED LEAF (Exobasidium vaccinii). A sl. infection was noted on native blueberries near Normandin, Que. Galls, about 1/4 in. in diam. on leaves and main stems, were present similar to those illustrated by Woronin in his original studies; this phase of the disease has not previously been observed. In one field in Cumberland Co., N.S. 30% of the shoots were infected; however, the av. infection was about 0.3% in low bush blueberry fields in N.S. and N.B. (C.L. Lockhart).

CANKER (Fusicoccum putrefaciens) caused sev. damage in many plantations of high bush blueberry at Pitt Meadows and on Lulu Island, B.C.; frequently there were several infections on a single plant (W.E. McKeen).

LEAF SPOT (Glomerella cingulata). The Gloeosporium stage sl. infected native blueberries at Musquodoboit Harbour, N.S. (C.L. Lockhart).

CANKER. A species of Hendersonia was isolated from a stem canker collected on blueberries at Steam Mill, N.S.; it proved to be pathogenic (C.L.L.).

LEAF BLIGHT (Lophodermium melaleucum) was found affecting V. vitis-idaea causing a browning or a graying of 1-2% of the leaves at Musquodoboit Harbour, N.S. (C.L.L.).

DIE-BACK (Phomopsis vaccinii). This organism is found in most native blueberry fields in N.S. It fruits abundantly, mostly showing up on twigs after they have produced a crop of berries (C.L.L.).

The conidial state of Valsa delicatula was found associated with Phomopsis vaccinii on blueberry twigs affected by die-back at Lower Chebogue, N.S. (C.L.L.).

GRAPE

DEAD ARM (Fusicoccum viticola). Reports and specimens of dead arm were received from many old Concord vineyards in the Niagara Peninsula, Ont. In some vineyards 20% of the vines are affected. Infection of current cane growth was sl. this year (G.C. Chamberlain). In 3 acres of Campbell's Early nr. Queenston 95% of the vines were affected; as the affected vines were not productive, the grower was advised to remove the entire vineyard (G.W. Eaton). In one large Concord vineyard at Milton, dead arm was sev., about 40% of the vines being infected (W.S. Carpenter).

DOWNY MILDEW (Plasmopara viticola). An outbreak of mildew appeared suddenly on vigorously growing vines of Agewan, sev. infecting the new growth at Niagara, Ont. At St. Catharines a scattered infection occurred on the foliage of Agewan and at Winona the fruit clusters of Fredonia, but not the foliage were affected (G.C. Chamberlain). Downy mildew was present in vineyards of Fredonia and Van Buren at Burlington, Milton, Oakville and Dixie. Mildew was heavy on both foliage and fruit and losses were sev. in 2 vineyards of Worden; one grower did not pick a bunch from a 6-acre planting. Where the applications were timely and coverage adequate infection was sl. Growers who missed the pre-blossom spray were hit the worst (W.S. Carpenter). Diseased berries were received from Carleton Place (H.N. Racicot).

POWDERY MILDEW (Uncinula necator). Infection was heavy and fruit damage sev. on a greenhouse vine at the University, Vancouver, B.C. A mod. foliage infection was observed on a vine in a neglected garden in n. Vancouver (H.N.W. Toms). Numerous fruit clusters were infected in a planting of Pineau Blanc at St. Catharines, Ont.; the variety appears to be extremely susceptible. Infections on the peduncles also caused, according to the grower, a loss of half the crop from shelling during handling in a planting of Lincoln at Port Dalhousie (G.C. Chamberlain).

CHEMICAL INJURY. Roadside spraying with 2,4-D caused mod. to sev. injury to about a third of the vines in a vineyard of 21,000 vines at Stamford, Ont. (G.C.C.).

LEAF SCORCH (potash deficiency) was common in vineyards in the St. Catharines area, Ont. in the late season (G.C.C.).

STRAWBERRY

GRAY MOLD (Botrytis cinerea caused a loss of 10-12% of the crop on Vancouver Island, B.C.; captan appeared to be partially effective (W.R. Foster). Infection was sl. at the end of a cool wet June, but, owing to sev. winter killing, damage to surviving plants was also sl. (H.N.W. Toms). Fruit rot destroyed 50-60% of the fruits in many gardens at Harrow, Ont. Heavy foliage on the vines and moist weather provided conditions very favorable for Botrytis (C.D. McKeen). Gray mold was very sev. in many plantings and losses were considerable throughout the Toronto-Hamilton area. In one 5-acre Premier patch not a berry was picked. Weather conditions were ideal for infection for prolonged periods; where foliage was dense, irrigation used and no fungicide applied, losses were high. Where captan was used in 6 pre-harvest sprays, the crop was greatly benefited. Programs started in early bloom appeared to give better results than those started later. In an experimental block of Premier, where 6 pre-bloom applications of captan, 3 lb. actual per acre, were used the av. results were as follows:

	Berries per box	Percentage of rotted fruits at picking	Percentage of rotted fruits 3 days after
Treated	81.4	5.3	16.2
Check	113.8	13.3	30.2

A high percentage of the lower fruits under dense foliage were affected in a planting of Senator Dunlop at Ste Foy, Que. (D. Leblond). A tr. to 5% of the fruits were rotted in plantings of Senator Dunlop about the Narrows, N.B. (S.R. Colpitts). Fruit rot was particularly sev. in all strawberry-growing areas in N.S. In unsprayed picking beds as high as 60% loss occurred; the average loss was about 5-10% of the crop (C.O. Gourley).

LEAF BLIGHT (Dendrophoma obscurans). A tr. was recorded on Senator Dunlop at the Farm, Kentville, N.S. (C.O.G.).

LEAF SCORCH (Diplocarpon earliana) was very prevalent on Premier in the Toronto-Hamilton area, Ont., even where bordeaux and captan had been used (W.S. Carpenter). A tr. was observed on overwintered leaves at Kentville, N.S. on 29 May, and again on the foliage of Senator Dunlop in September (C.O.G.). A sl. infection was seen on Premier in a garden at Charlottetown, P.E.I. (R.R. Hurst).

LEAF BLOTCH (Gnomonia fructicola). A very sl. infection was seen at MacDonalds Corners, N.B. 12 July (C.O.G.).

LEAF SPOT (Mycosphaerella fragariae) was generally prevalent on British Sovereign in small patches in home gardens in the Pemberton Valley, B.C.; in the Fraser Valley, this disease has not been noted on this particular variety (R.E. Fitzpatrick). Leaf spot was prevalent in the early season on susceptible varieties such as Louise, Erie and Empire in the Toronto-Hamilton area, Ont.; Premier was sl. infected (W.S. Carpenter). Infection was a tr. to 80% on the varieties cultivated in N.B. (S.R. Colpitts). Most varieties were infected in N.S., some of the more susceptible being rather sev. diseased. Spraying with captan has considerably reduced the infection level (C.O. Gourley). A sl. infection was noted on Sparkle at York, P.E.I. while Senator Dunlop and Catskill were free of infection (J.E. Campbell).

RED STELE (Phytophthora fragariae) was found in about 25% of the plantings examined on Vancouver Island, B.C.; 10 years ago about half the plantings were affected (W.R. Foster).

ROOT-LESION NEMATODE (Pratylenchus penetrans) was observed in a number of plantings of Premier examined in the Niagara Peninsula and Norfolk Co., Ont. Distinct brown scratch-like lesions could be seen on the white roots of daughter plants. The number of lesions present was closely correlated with number of P. penetrans in the soil. From these lesions root-rotting organisms spread into the roots (J.L. Townshend). Only a slight response to fumigation was noted in the yields of Empire the second cropping season in 3 fumigation plots laid down on a farm in Toronto-Hamilton area. Mr. Townshend found Paratylenchus and Pratylenchus present in above-average numbers (W.S. Carpenter).

POWDERY MILDEW (Sphaerotheca humuli). A sl.-mod. infection was generally distributed on s. Vancouver Island, B.C.; it was only sl. and patchy in the Fraser Valley (W.R. Foster). The disease was observed both on plants in the greenhouse and in outside plantings at the Univ., Edmonton, Alta. (A.W. Henry). Powdery mildew was noted in isolated spots in a few Premier plantings in the Toronto-Hamilton area, Ont. (W.S. Carpenter). A sev. infected specimen of Everbearing strawberry was received from St. Prime, Que. (D. Leblond). A rather heavy infection on Senator Dunlop at Waterville, N.S. was checked by an application of Karathane on 4 Sept. with very little damage resulting from the infection (C.O. Gourley). A very sl. infection was noted on Premier in a home garden and traces in commercial plantings throughout Queens Co. P.E.I. (R.R. Hurst).

WILT (Verticillium albo-atrum) is one of the most destructive diseases in the Toronto-Hamilton area, Ont. It has appeared occasionally in plantings

on new ground where a susceptible crop has not previously been grown. The disease is sev. in Premier, Louise, Erie and in some of the new Ottawa strains; mod. in Empire and Sparkle and very sl. in Catskill (W.S. Carpenter).

ROOT ROT (various pathogens) is a perennial problem particularly in 2-year-old patches in the Toronto-Hamilton area, Ont. A nematode survey conducted by Mr. Townshend revealed that even in healthy appearing plantings the roots were often in very poor condition. Abundance of soil moisture and cool temperatures probably kept many of these plantings from burning up (W.S. Carpenter). Affected specimens were received in 5 widely separated localities; loss at some of these places was appreciable (D. Leblond). Although most fields are infected by root rot in N.B. on account of a favorable picking season yields were generally good and the plantings suffered only a sl. reduction of yield from root rot (S.R. Colpitts). In recent years several cases of root rot in P.E.I. have been brought to the attention of the Charlottetown laboratory. However it is not considered to be a serious problem (J.E. Campbell).

GREEN PETAL (virus). A survey in N.B. revealed that a tr. occurred in most fields of Senator Dunlop examined. In N.S. it is also present in all areas where strawberries are grown; infection in most plantings was 1-2% (C.O. Gourley). In a small patch of Temple at Jemseg, N.B., 80% of the plants were affected (S.R. Colpitts).

JUNE YELLOWS (genetic breakdown) is very common in Climax in B.C.; in consequence the variety is unsuited for here (W.R. Foster). After a sev. outbreak of yellows in Premier in 1955, most of yellows this season was confined to patches of Premier that were held over for cropping another year. In some, 80% of the plants were affected (W.S. Carpenter). About 10% of the plants were affected in a Premier planting at Port Weller (G.C. Chamberlain). A tr. was noticed in Premier at Jemseg, N.B. (S.R. Colpitts).

The improved vigor of virus-free Premier, Empire, Erie, Catskill, Sparkle and the new Ottawa seedlings over present commercial stands of Premier, Sparkle and Louise in the Toronto-Hamilton area is very noticeable. In consequence, growers are increasing their plantings of all varieties available except Premier (W.S. Carpenter).

FROST INJURY A low of 23°F. on 24 May reduced the first 2 pickings in the Toronto-Hamilton area Ont. by 10-25% (W.S.C.).

V. DISEASES OF TREES AND SHRUBS

ABIES BALSAMEA

Twig Canker (Fusicoccum abietinum Prill. & Delacr.) was found on two specimens from N.B., one collected in 1954, the other in 1956. There are no previous records of this fungus in Canada, although it may be a synonym of Phoma abietina Hartig according to W.B. Grove. P. abietina occurs on A. grandis and A. lasiocarpa in U.S.A. (J.A. Parmelee).

ACER

Canker (Cytospora chrysosperma) killed many young trees of Acer platanoides in nurseries and in street plantings in Montreal, Que. Large trees of Acer saccharinum were completely girdled by this disease (E. Jacques).

Leaf Spot (Gloeosporium apocryptum) caused leaf curl and defoliation of Japanese maple at Essex, Ont. The tree has been affected for several years (R. Walsh). G. saccharinum was found on leaves of A. saccharum from P.E.I. (J.A. Parmelee).

AESCULUS - Horsechestnut

Leaf Blotch (Guignardia aesculi) was present in sl. amounts on shade trees in Kentville, N.S. (C.O. Gourley).

AMELANCHIER

Black Leaf Curl (Apiosporina collinsii). Sev. damage to a branch of a tree noted in a nursery at Calgary, Alta. (M.W. Cormack).

BERBERIS - Barberry

Rust (Puccinia graminis) affected 1 bush in a hedge at Meadowvale, Ont., and 4 large bushes at Burlington (H.S. Thompson).

BETULA - Birch

Leaf Curl (Taphrina carnea) was noted on specimens of B. lutea from Kings and Victoria counties, N.B. (J.A. Parmelee).

CATALPA

Wilted and apparently dying trees were reported by 3 householders nr. Harrow, Ont. The cause was thought to be Verticillium. By late August new leaves were appearing on affected limbs (R.W. Walsh).

CORNUS

Leaf Spot (Septoria cornicola) affected 85 plants of C. sanguinea var. variegata in a nursery at Whitby, Ont. (H.S. Thompson).

CRATAEGUS - Hawthorn

Rust (Gymnosporangium clavariaeforme) was found on 90% of fruits on Rosa Plena variety at Kentville, N.S. (J.F. Hockey). The English hawthorns on the Kentville Experimental Station were sev. affected (D.W. Creelman).

Powdery Mildew (Podosphaera oxycanthae) was found on a sample received from L'Islet, Que. (D. Leblond).

FAGUS - Beech

Leaf Spot (Gloeosporium fagicola) was found on specimens of F. grandifolia from Kent Co. and York Co., N.B. Specimens in DAOM herbarium include others from N.B. and one from Ont. (J.A. Parmelee).

ILEX

Trochila ilicis was found on leaves of I. aquifolium sent from Victoria, B.C. for identification. No previous N. American reports have been found. The fungus was placed in Phacidiales as Eustegia ilicis Chev. but sections show the fruit body to be cup-shaped and the fungus is more properly included in Helotiales as Trochila ilicis (Chev.) Rehm (J.A. Parmelee).

JUGLANS

The Melanconium stage of Melanconis juglandis was found on J. cinerea from Fredericton, N.B. (J.A. Parmelee).

JUNIPERUS

Rust (Gymnosporangium bermudianum) was collected nr. Ferndale, Bruce Co., Ont. The rust is unusual in having aecia on juniper on galls that later produce telia. Collections made in May were immature, but mature specimens were collected in August. The previously known range of this species was Bermuda, Bahama Islands, and the Gulf States. This report extends greatly the range of the fungus and is the first report on J. horizontalis (J.A. Parmelee).

LONICERA - Honeysuckle

Kabatia lonicerae was found on spots on L. americana leaves collected at Boischatel, Que. The infection was mod. (D. Leblond, R.A. Shoemaker).

Leaf Blight (Herpobasidium deformans) was present in mod. amounts on 2000 trees in a nursery at Clarkson, Ont. (H.N. Racicot, H.S. Thompson). In Que. this disease was general in nurseries again this year on L. tatarica. Most of the infections were mod. but a few sev. infections were noted (J. Ringuet). Also reported on L. tatarica from Ancienne Lorette, (D. Leblond).

Powdery Mildew (Microsphaera alni) was sev. on L. tatarica in a nursery at Charlesbourg, Que. (J. Ringuet).

MALUS - Flowering crab

Disfigurement (Phomopsis mali) of the fruit occurred in a garden in Vancouver, B.C. (H.N.W. Toms, R.A. Shoemaker).

Scab (Venturia inaequalis) affected a tree on the University campus, Vancouver, B.C. (H.N.W.T.).

PINUS - Pine

Blister Rust (Cronartium ribicola). Near Kenora, Ont. the characteristic flags of blister rust were noted on P. strobus on the mainland and islands. Usually only one flag was seen on each infected tree. No dead trees were seen (W.L. Gordon). One specimen was received from Saint-Hilaire, Que. (P. Duval), and one from St. Gregoire (D. Leblond). About 5% of a young stand of white pine was lost because of trunk infections at Kentville, N.S. Aecia were shedding spores on May 17. (C.O. Gourley).

POPULUS - Poplar

Leaf Spot (Septoria musiva) was found on P. tremuloides from York Co., N.B. (J.A. Parmelee).

Yellow Leaf Blister (Taphrina populina) was present on two leaves sent in from Antigonish Co., N.S. The fungus is represented in DAOM by 2 collections from Que. and 1 from B.C. (D.W. Creelman, R.A. Shoemaker).

QUERCUS - Oak

Powdery Mildew (Microsphaera alni) occurred on a Q. rubra specimen from Hobbscross, N.B. (J.A. Parmelee).

Twig Curl (Coryneum stage of Pseudovalsa longipes) was found on Q. rubra from Fredericton, N.B. (J.A. Parmelee).

ROBINIA - Locust

Tubercularia vulgaris was found on twigs of R. pseudo-acacia from La Gorgendiere, Que. (D. Leblond). A species of Ascochyta was also present on the pods but conidia were smaller than the dimensions give for A. robiniae described in Europe.

SALIX - Willow

Blight (Fusicladium salliciperdum) noted from Riviere du Loup, and Perce, Que. on S. lucida and from St. Redempteur on S. alba var. tristis (D. Leblond). S. babylonica var. aurea trees in a nursery in Charlottetown, P.E.I. were sev. infected and blighted in June. Twenty trees from this nursery planted at Montague also exhibited die-back (J.E. Campbell).

Marssonina kriegeriana was present in mod. amounts on S. alba var. tristis at Sillery, Que. (D. Leblond).

Canker (Cytospora chrysosperma stage of Valsa sordida). Several sev. diseased specimens were obtained from Winnipeg, Man. (W.C. McDonald).

Crown Gall (Agrobacterium tumefaciens) occurred on S. alba var. tristis tree at Sillery, Que. (D. Leblond).

SORBUS

Micropera sorbi (Fr.) Sacc. and the Sphaeropsis stage of Physalospora obtusa occurred on S. americana from Robertsons Point, N.B. (J.A.Parmelee).

Fire blight (Erwinia amylovora). Mod. infection was noted on 1 tree at Lethbridge, Alta. (F.R. Harper). In Edmonton many fine trees were lost because of fire blight in 1956 (W.P. Campbell). Several trees were heavily infected at Lachine. It was also found on nursery stock at Aylmer, Que. (H.S. Thompson). Infection was sev. in one row of trees in Montreal Botanical Garden. Many specimens were received from private gardens in Montreal (P. Duval). Also noted from Grand Mere, Que. (D. Leblond).

TAXUS

Sunburn. Because frost penetrated deeply in the fall of 1955 before the ground was covered with snow, woody plants, particular conifers suffered more winter damage than usual in the Ottawa district, Ont. Observations indicate that reflected heat from the snow surface or from white-painted walls often causes more damage than the direct rays of the sun. This burning is one of the determining factors in choosing evergreens for this district. Both erect and spreading forms of Taxus cuspidata are far superior to the hybrid forms 'Hicksii' and 'Hatfieldii,' which have been regularly injured and were worse than usual this year. With the exception of Juniperus communis var. suecica and J. squamata var. meyeri, most of the commonly used junipers seem to stand up well. They do well on the south and west of buildings. Cedars (Thuja) are very susceptible to sunburn. Most of the hedges at the Farm are brown and will take a season or two to recover. Some of the named varieties are quite susceptible. The form 'rosenthalii' showed more damage than the common pyramidal form, the form 'woodwardii' than the common globe forms, and 'douglasii pyramidalis' more than the ordinary golden form. (R.W. Oliver).

THUJA

Winter drying was severe. It was noted specifically on T. occidentalis at Carleton and Charlesbourg, Que. in addition to telephoned inquiries. Similar damage was noted on wild white cedar (D. Leblond).

TILIA - Linden

Cercospora microsora affected 25% of the foliage of 20 young T. europaea trees in a nursery in Annapolis Co., N.S. Bordeaux spray applied to control spot anthracnose failed to control the Cercospora leaf spot (D.W. Creelman).

Spot Anthracnose (Elsinoe tiliae) caused mod. sev. damage to T. europaea in Lunenberg Co. Trees sprayed with captan were less severely affected. The disease was not so sev. as in 1954 or 1955 (D.W. Creelman).

Anthracnose (Gloeosporium tiliae). One specimen on T. europaea was received from Halifax, N.S. (D.W. Creelman).

ULMUS - Elm

Dutch Elm Disease (Ceratocystis ulmi (Buism.)Moreau). Large numbers of trees have died in woodlots and resort areas in s.e. Essex Co. About 35 infected trees were destroyed on the Experimental Station, Harrow, Ont. (R.W. Walsh). This binomial was proposed by Moreau (Rev. Mycol. 17, Suppl. Col. No. 1, p. 22, 1952) based on Ceratostomella ulmi Buism. Hunt, in his monograph of Ceratocystis (Lloydia 19:1-58. 1956) has accepted the name (D.W.C.).

Black Spot (Gnomonia ulmea) caused defoliation of trees at two locations nr. Harrow (R.W. Walsh). It was seen in 5 nurseries in Que. where it caused sl. spotting of U. pumila leaves (J. Ringuet).

Coral Spot (Tuburcularia ulmea). Many specimens were received at Montreal Botanical Gardens from Montreal residents. The Botanical Garden staff does not recommend planting chinese elm because they are destroyed by coral spot (P. Duval).

Canker (Nectria sp.) was found on U. pumila in Quebec City, Que. (D. Leblond). The Tuberculariа vulgaris conidial state of Nectria cinnabarina was found on 2 specimens, 1 from Pointe Claire, Que. and the other from Sydney, N.S. (H.S. Thompson).

VI. DISEASES OF ORNAMENTAL PLANTS

ABUTILON

Nematode galls were found on house plants thought to have been brought from E. Canada 2 or 3 years ago to Saskatoon, Sask. The galls on Abutilon, Begonia and Coleus were caused by Meloidogyne incognita Kofoid & White according to Miss G. L. Brown, Nematode investigations, Ottawa (T. C Vanterpool).

ALTHAEA - Hollyhock

Rust (Puccinia malvacearum) was present in mod. amounts at Fort Garry, Man. in Aug.; in Sept. infection was sev. (W. L. Gordon). Sev. affected specimens were received from Knowlton and St. Elzear, Que. (H. S. Thompson), and from Montreal (P. Duval). In N. S. specimens were received from Hants, Kings, and Halifax counties (J. F. Hockey). Sev. damage was caused to many varieties in Queens and Kings Counties, P. E. I. Single varieties showed very little rust. Dithane Z-78 was recommended and prevented defoliation; 3 or 4 applications at 10-14 day intervals were made. Unsprayed plants were sev. defoliated and produced only dwarfed flower stalks (R. R. Hurst).

AMARYLLIS

Red Blotch (Stagonospora curtisii) was present in mod. amounts on A. hippeastrum in greenhouses at Montreal Botanical Garden, Que. (P. Duval).

ANTIRRHINUM - Snapdragon

Stem Rot (Botrytis sp.) was found on 2/1000 seedlings in flats at Hamilton, Ont. The fungus was sporulating on the base of the stem (W.G. Kemp).

Powdery Mildew (Oidium sp.). A mod. infection was observed on half of 1000 White Spartan seedlings in flats at Hamilton, Ont. (W. G Kemp).

Wilt (Rhizoctonia solani). A number of plants in a greenhouse in Brampton, Ont., were wilted R. solani was isolated from diseased specimens (H. N. Racicot).

ASTER

Rust (Coleosporium solidaginis) covered all the plants of A. dumosus cultivated in a nursery in Portneuf Co., Que. (J. Ringuet).

ATROPA

Berry Rot was observed on A. belladona at La Gorgendiere, Que., Botrytis cinerea and Cladosporium sp. were present on the rotted fruit (D. Leblond).

BEGONIA

Blight (Botrytis sp.) affected cuttings in Portneuf Co., Que. (D. Leblond), and 3 plants in a garden in Queens Co., P. E. I. (R. R. Hurst).

Powdery Mildew (Erysiphe cichoracearum) sev. affected cuttings rooted in sand in a greenhouse in Hamilton, Ont. (W.G. Kemp). It was sev. on tuberous begonias at several places in Montreal (E. Jacques), and two places in Quebec City, Que. (D. Leblond).

Nematode galls , see ABUTILON

CALENDULA

Aster Yellows (Calistephus virus 1) infections were sl.-mod. in a plot at Saskatoon, Sask. (T.C. Vanterpool). Leafhoppers were scarce until late in the season and infestations were not as heavy as in the past 3 years (T.C. Vanterpool). Yellows were not as troublesome as usual this year. Infection appeared later and some N.S. gardens were free of this disease (K.A. Harrison). One garden in Queens Co., P.E.I., was sev. affected; 75% of plants were diseased (R.R. Hurst).

CALLISTEPHUS - China aster

Wilt (Fusarium oxysporum f. sp. callistephi) was present in 2 gardens in Edmonton, Alta.; 10% of the plants were affected in one garden (A.W. Henry). A diseased plant was brought in from a home garden in St. Catharines, Ont.; a few plants were also affected in the laboratory garden (W.G. Kemp). Infected specimens were received from a garden in Montreal, Que. (P. Duval).

Yellows (Callistephus virus 1) affected half the plants in the laboratory garden, St. Catharines, Ont.; the blooms were malformed, colors broken and the foliage yellow. A single plant was infected among 1500 New Ball White examined at Brampton, Ont. (W.G. Kemp). Yellows affected a few plants in the flower beds at Ste. Anne de la Pocatiere, Que. (R.O. Lachance). It was observed in several gardens at Kentville, N.S. (J.F. Hockey).

CANNA

Leaf spots on a specimen from Ste. Foy, Que., collected by D. Leblond were found to bear a Leptosphaeria sp. and a Phaeoseptoria sp. No record of members of these genera on Canna has been found (R.A.S.).

CHRYSANTHEMUM

Powdery Mildew (Erysiphe cichoracearum) occurred only in tr. amounts on White Shasta and Yellow Shasta in Wentworth Co., Ont. (W.G. Kemp).

Stem rot (Rhizoctonia solani) affected only Indianapolis White cuttings in a bed where 15 varieties were being rooted at St. Catharines, Ont. (W.G. Kemp).

Wilt (Sclerotinia sclerotiorum). An unusual attack of mature greenhouse plants occurred in Brampton. The infection developed on the stem at leaf scars. Sclerotia were found in the pith. About 100/800 White Top plants were affected (W.G. Kemp).

Leaf Spot (Septoria sp.) was sev. on Ethrelda and Monty at Leamington and Revelation at London. Septoria sp. and Cylindrosporium sp. were isolated

from the lower leaves of Coquette sent in from Port Burwell, Ont. The Septoria was associated with well defined spots whereas the Cylindrosporium induced a blotch (W.G. Kemp).

Foliar nematode (Aphelenchoides sp.). A specimen from Bras d'Or Twp., Victoria Co., N.S., was slightly damaged by nematodes (K.A. Harrison).

CIMICIFUGA - Bugbane

Leaf Spot (Ascochyta sp.) was found in tr. amounts in Quebec City, Que. (D. Leblond).

CLEOME

Leaf Spot (Ascochyta sp.). A sl. infection was found on spider plant (C. spinosa) at Ste. Foy, Que. (D. Leblond).

Yellows virus was present in mod. amounts in the same planting.

COLEUS

Nematode galls; see ABUTILON.

CONVALLARIA

Grey Mold (Botrytis cinerea) was present on plants of C. majalis sent from Chateau d'Eau, Que. (D. Leblond).

CYCLAMEN

Soft Rot (Erwinia carotovora) damaged all 6 potted plants in a greenhouse in Queens Co., P.E.I. (R.R. Hurst).

DELPHINIUM

Powdery Mildew (Erysiphe polygoni) damaged some plants in Edmonton, Alta. (W.P. Campbell). It was very sev. on a few plants in the laboratory garden at St. Catharines, Ont. (W.G. Kemp). Tr. amounts were present in a garden at Contrecoeur, Que. (E. Jacques). Sl. amount was found in Quebec City (D. Leblond). Damage in Prince and Queens Counties, P.E.I. ranged from sl. - sev. (R.R. Hurst).

Bacterial Blight (Pseudomonas delphinii) was observed in 5 Quebec nurseries; infections varied from 10 to 75% (J. Ringuet). Mod. damage was done in an abandoned garden in Kings Co., P.E.I. (R.R. Hurst).

Yellows (Calistephus virus 1) damaged a few plants sev. in a garden at Lethbridge, Alta. (M.W. Cormack).

DIANTHUS - Carnation

Flower Blight (Botrytis sp.) was sev. on first year growth at Norval, Ont. (H.S. Thompson). A few Midas plants were affected in a greenhouse at Brampton. The blooms were enveloped by mycelium and the organism was sporulating freely. (W.G. Kemp).

Stem Rot (Fusarium sp.) affected cuttings grown in a greenhouse in Alta. (A.W. Henry). Fusarium sp. was isolated from rotted stem tissue of a specimen sent in from London, Ont. (W.G. Kemp).

Wilt (Fusarium sp.) was very sev. on 2 year old Northland plants; all plants were affected in a greenhouse bench at Brampton, Ont. (W.G. Kemp). A display plot was sev. affected at the Botanical Garden, Montreal, Que. (P. Duval).

Fairy Ring Spot (Heterosporium echinulatum) was sev. on leaves of Haney plants received from B.C. (H.S. Thompson).

Stem Rot (Rhizoctonia solani). The pathogen was isolated from Mamie and Jupiter plants from St. Catharines and from greenhouse plants from Brampton, Ont. (W.G. Kemp).

Sclerotinia Rot (S. sclerotiorum) was isolated from 2 plants, the only ones affected, in a greenhouse bed at Leamington, Ont. (H.S. Thompson).

Rust (Uromyces caryophillinus). White Sim plants that were sl. rusted when brought into greenhouse from outdoors at Grimsby, Ont., were mod. infected by flowering time. Midas and Northland were mod. infected outdoors at St. Catharines. In a Brampton greenhouse Apollo, Wm. Sim and Northland were affected. In another greenhouse in Brampton rust on Red Sim was present on newly rooted cuttings but Parzate sprays at 14-day intervals kept the rust at tr. amounts (W.G. Kemp). A mod. outbreak occurred in a greenhouse in Montreal, Que. (E. Jacques).

Pimple (Xanthomonas oryzae var. dianthi) infection was sl. less than 1% of 450 cuttings of Apollo. Hermes and Achilles were affected in a greenhouse at Guelph, Ont. (E.H. Garrard).

Bacterial Wilt (Pseudomonas caryophilli) occurred on cuttings imported from U.S.A. The cuttings were grown in a greenhouse in Brampton, Ont. About 20% of 4,050 Red Sim plants were affected in 1954 but no trace of the disease has been seen since then (E.H. Garrard).

Yellows (virus). Affected specimens were received from Amos, Abitibi, Co., Que. Infection was mod. but appeared to be spreading rapidly (P. Duval).

EUONYMUS

The Tubercularia vulgaris stage of Nectria cinnabarina was present on a specimen of E. alatus received from a nursery in Ottawa, Ont. (H.N. Racicot, H.S. Thompson).

EUPHORBIA - Poinsettia

Stem rot (Pythium sp.). Isolations from potted plants showing stem rot and wilt symptoms received from Grimsby, Ont. yielded Pythium sp. and bacteria; only Pythium was pathogenic when tested (W.G. Kemp).

Stem Rot (Rhizoctonia solani) was sev. on unrooted cuttings in a greenhouse in Brampton, Ont. Half the plants in a propagating bed were affected (W.S.K.).

GAILLARDIA

Yellows (Callistephus virus 1) damaged plants sev. in Queens Co., P.E.I. (R.R. Hurst).

GLADIOLUS

Corm Rot (Curvularia trifolii f. sp. gladioli) was observed at Ste. Foy (D. Leblond) and Quebec City, Que. (H.S. Thompson).

Core Rot (Botryotinia draytoni). Several corms imported from Holland were sev. affected on arrival at Lethbridge, Alta. (R.P. Stogryn). Over half the 1955 crop produced by a grower at Navan, Ont., was sev. affected. The disease developed in storage. Other residents of Navan had similar symptoms on their corms (H.S. Thompson). Late season foliage infection was general in a 3 acre block in Kings Co., N.S. (J.F. Hockey).

Fusarium Yellows (Fusarium oxysporum f. gladioli) was present on some varieties and caused mod. - sev. damage at Carp, Ont. (H.S. Thompson). Infections in an Ottawa nursery were: Patrol 100%, Evangeline 80%, White Goddess 25%, High Finance 75%, Chamony 50-80% while others had 0-tr. amounts (H.S. Thompson). Diseased specimens were received from Aylmer East, Berthierville, South Roxton, Ste. Eustache, Que. (H.S.T.) and St. Francois du Lac, Beaumont, Ste. Foy, Que. (D. Leblond).

Leaf Browning (Penicillium sp.) appears darker than that caused by Fusarium yellows. Old and young corms yielded only 1 organism, Penicillium (D. Leblond).

Leaf Spot (Phyllosticta sp.) of Yellow Herald occurred at Ste. Foy, Que. (D. Leblond).

Hard Rot (Septoria gladioli) was present on specimens received from Huttonville, Ont., where it caused sev. damage to 200 plants and from a garden in Montreal, Que. (H.S. Thompson).

Dry Rot (Stromatinia gladioli) caused mod. damage to 2000 plants at Ancaster, Ont. (H.S.T.). Disease was noted at Baie St. Paul, Ste Foy, Que. (D. Leblond), Montreal and Quebec City (H.S.T.). Also noted from Moncton, N.B. (H.S.T.) and Kings Co., N.S. where up to 20% of some varieties showed stem rot (J.F. Hockey). The disease has increased in commercial fields during recent years (D.W. Creelman).

Verticillium albo-atrum was found on corms from Champlain, Que. (D. Leblond).

Scab (Pseudomonas marginata) was observed on corms received from Maxville, Ont., Granby, Aylmer East, Que. (H.S.T.) Champlain, Que. (D. Leblond) Montreal (P. Duval) Moncton, N.B. (H.S.T.) and Queens Co., P.E.I. (R.R. Hurst).

White Streak (virus) was sev. on leaves of Burma and Circe, mod. on Frank Hall at Ste. Foy, Que. (D. Leblond).

Break (virus) was sev. on petals of Burma and mod. on Frank Hall at Ste. Foy, Que. (D. Leblond).

HYACINTHUS - Hyacinth

Soft Rot (Erwinia carotovora) was sev. in some gardens in Queens Co., P.E.I. (R.R. Hurst).

Yellows (Xanthomonas hyacinthi). One lot on Vancouver Island and 2 on the B.C. mainland were rejected on account of yellows, tr. amounts occurred in the latter two. (N. Mayers).

HYDRANGEA

Powdery Mildew (Oidium sp.) was noted in a greenhouse in Quebec City, Que. (D. Leblond).

IMPATIENS

Leaf Spot (Pleospora sp.) was collected on I. balsamina at La Gorgendiere, Que. (D. Leblond).

IRIS

Leaf Spot (Didymellina macrospora) caused sl. infection in 1 field on Vancouver Island but was not observed on B.C. mainland. (N. Mayers). The conidial state, Heterosporium iridis caused sev. damage in one garden at Rawdon in Que., (P. Duval) and one in Queens Co., P.E.I. (R.R. Hurst).

Soft Rot (Erwinia carotovora) affected a few plants at Botanical Garden, Montreal, Que. (P. Duval).

Eelworm (Ditylenchus dipsaci) was present in tr. amounts in 1 plot on Vancouver Island, B.C. (N. Mayers).

LATHYRUS - Sweet pea

Streak (Erwinia lathyri) was present on a sev. damaged specimen from Queens Co., P.E.I., where diseases have made sweet pea culture difficult (R.R. Hurst).

Mosaic (?virus) affected a specimen from a garden in Montreal, Que. (P. Duval).

LILIUM - Lily

Blight (Botrytis elliptica) was mod. - sev. in seedling beds at Ottawa, Ont.; the cool, moist season favored disease development (H.S. Thompson). Samples were received from St. Gabriel de Brandon, St. Cesaine, and Montreal. (H.S.T.). In Kings Co., N.S. Regale plants were heavily infected during early summer and defoliated by Sept. (K.A. Harrison).

Bulb Rot (cause unknown), Isolations from Glow Lily received from Senlac, Sask., yielded Fusarium sp., Colletotrichum sp., Rhizoctonia solani and Ramularia sp. (T.C. Vanterpool).

LOBULARIA - Sweet Alysum

Club Root (Plasmodiophora brassicae) affected plants of L. maritima in flowerbeds on a farm adjacent to the Muck Research Station, Bradford Marsh, Ont. (O.T. Page).

LONICERA - Honeysuckle

Staghead (Glomerularia lonicerae, stat. conid. of Herpobasidium deformans) specimens were received from Boucherville and Orsainville, Que. (H.S. Thompson).

LYCHNIS - Maltese Cross

Leaf Blight (Volutella sp.) was present in tr. amounts on L. chalcedonia in a park in Quebec City, Que. (D. Leblond).

MAHONIA AQUIFOLIUM

Rust (Cumminsiella mirabilissima) caused mod. damage to 25 plants at Clarkson, mod. damage to 3/43 plants at Oakville, mod. to 12 plants at Keswick, sev. to 775 plants at Richmond Hill and mod. to plants from Richmond Hill growing at Ottawa, Ont. Sev. affected specimens received from Village des Aulnaies and Ste. Foy, Que. (H.S. Thompson).

MALVA

Anthracnose (Colletotrichum sp.) sev. affected plants of M. neglecta at Guelph, Ont. Many plants had most of the leaves or all the above-ground parts killed. (L.V. Busch).

NARCISSUS

Neck Rot (Botrytis narcissicola) affected 21% of Vancouver Island plantings; ratings were from 0.6 - 8.5%. On the B.C. Mainland 25% of plantings were diseased. The av. infection was 5.2% and one field had 35% infection, the highest ever noted during inspections. Freezing, in the early winter when the ground was bare of snow probably contributed to the damage (N. Mayers).

Leaf Scorch (Stagonospora curtisii) was not found on Vancouver Island, but every planting inspected on the B.C. Mainland was infected. (N. Mayers)

Mosaic (virus). On Vancouver Island 50% of the plantings were affected, infection being 0.15 - 0.6% while the previous year it occurred in every planting. On the B.C. Mainland 27% of plantings were affected compared with 5% last year but the av. infection 0.1%, was the same. (N. Mayers).

Decline (White streak and associated viruses) affected 57% of plantings on Vancouver Island (100% 1955) ranging from 0.3 - 8.3%. On B.C. Mainland 67% were infected ranging from 0.5% to 7%, av. 2.3% (N. Mayers).

Bulb and Stem Nematode (Ditylenchus dipsaci) was found in 10% of mainland plantings; 2-sl. 1-mod. 1-sev. (N. Mayers).

Meadow Nematode (Pratylenchus pratensis). Soil samples showed that in 2 adjacent fields kept fallow for 3 years one mod. to tr. amounts and the other none although narcissus and tulips had been damaged 3 years previously (N. Mayers).

PAEONIA

Blight (Botrytis paeoniae) was sev. in 1 planting at Calgary and sl. in another at Lethbridge (W. M. Cormack). Sev. damage was observed at Edmonton, Alta. (L. E. Tyner). Mod. infection was observed in Brandon, Man. (J. E. Machacak). Specimens were received from Berthierville, Sherbrooke, and Shawinigan Falls, Que., and St. John, N. B. (H. S. Thompson). A few plants were sev. affected at Kentville, N. S. (J. F. Hockey).

Measles (Cladosporium sp.) affected foliage and stems sev. in a nursery in Norfolk Co., Ont. (C. B. Kelly).

Mosaic (virus). Characteristic symptoms were observed on a few isolated plants in the Botanical Garden, Montreal, Que. (P. Duval).

Ring Spot (virus) was identified on a few plants in a nursery in Kings Co., N. S. (J. F. Hockey).

Winter killing thinned many Alta. plantings during the winter of 1955-56 (L. E. Tyner).

PAPAVER - Poppy

Bacterial Blight (Xanthomonas papavericola) affected 25% of a planting of oriental poppies in Prince Co., P. E. I. Damage was considerable; peduncles were girdled, blackened, and covered with slime; sepals were blackened and petal development was stopped (J. E. Campbell).

PARTHENOCISSUS - Virginia Creeper

Powdery Mildew (Uncinula necator) was sev. in a planting in Winnipeg, Man. (J. E. Machacek), and in another stand in Quebec City, Que. (D. Leblond).

PELARGONIUM - Geranium

Basal Stem Rot (Botrytis cinerea and Pythium ultimum) affected most commonly grown varieties in the Okanagan Valley, B. C. The rot was general in distribution on cuttings propagated in greenhouses. Losses were from 10% to 75% (av. 50%). Most of the rot was caused by B. cinerea. Varieties varied considerably from quite resistant to very susceptible (G. E. Woolliams). Botrytis stem rot was prevalent in a greenhouse in London, Ont. Some infections occurred at wounds where cuttings had been taken. The fungus was sporulating on the plants which were crowded and very moist. The disease caused mod. damage in a propagation bench in a greenhouse in Brampton (W. G. Kemp).

Gray Mold (B. cinerea) caused very sev. damage to red geraniums in a greenhouse in Queens Co., P. E. I. (R. R. Hurst).

PETUNIA

Stem Rot (Sclerotinia sclerotiorum) did mod. damage to a planting in Assiniboine Park, Winnipeg, Man. (B. Peturson).

Yellows (Callestephus virus 1) destroyed most of a small planting in Assiniboine Park, Winnipeg, Man. (W. L. Gordon).

PHILADELPHUS

Leaf Spot (Ascochyta philadelphi). A sev. infection occurred in a nursery in Whitby, Ont. (H.S. Thompson).

Coniothyrium olivaceum var. philadelphi-coronarii was noted on a specimen from La Gorgendiere, Que. (D. Leblond, R.A. Shoemaker).

PHLOX

Dendrophoma sp. Plants in a rock garden in Quebec City, Que., were blighted (D. Leblond).

Powdery Mildew (Erysiphe cichoracearum) affected several plantings of perennial phlox in Hamilton, Ont. (W.G. Kemp). Sev. diseased specimens were received from Mountain Grove, Ont. and Montreal, (H.S. Thompson), Vaudreuil, (H.N. Racicot) Chaudiere and St. Joseph, Que. (D. Leblond). The disease was general in Montreal and vicinity (P. Duval). Heavy infection caused sl. damage to a planting which had poor air circulation in Charlottetown, P.E.I. (J.E. Campbell).

ROSA

Black Spot (Diplocarpon rosae) was sev. on hybrid tea roses; unsprayed plants were defoliated in August at St. Catharines, Ont. Reports indicate that the disease was sev. throughout the Niagara Peninsula (W.G. Kemp). Infection was sl. and the disease readily controlled with Parzate (zineb) in Botanical Gardens, Montreal, Que. (P. Duval). Unsprayed roses commonly had infection ratings up to 50% in Kings Co., N.S. (D.W. Creelman). Foliage sprayed with captan was in good condition while unsprayed hybrid tea and floribunda roses were sev. attacked at Kentville, N.S. (J.F. Hockey). Infection ranged from tr. - sev. in a garden in Queens Co. P.E.I. (R.R. Hurst).

Rust (Phragmidium spp.). Several gardens in Fort Garry, Man., were mod. affected (B. Peturson). Many varieties were sev. infected and damaged in Charlottetown, P.E.I. (R.R. Hurst).

Spot (Sphaceloma rosarum) caused sl. damage on hybrid tea leaves and canes in Prince Co., P.E.I. (J.E. Campbell).

Powdery Mildew (Sphaerotheca pannosa). At Winona, Ont. 100 Halo plants were sev. infected. Better Times and Briercliffe were mod.-sev. damaged at Concord, Ont. (W.G. Kemp). Infection was sev. in a garden at St. Ours, Que. (E. Jacques). Infections of 10-100% caused mod.-sev. damage to unsprayed climbers at Kentville, N.S. (D.W. Creelman). Sev. in Prince, Queens and Kings Counties, P.E.I. (R.R. Hurst) (J.E. Campbell).

Nematode (Xiphinema sp.) found in rotted root of greenhouse roses at Hamilton, Ont. (J.L. Townshend).

Crown Gall (Agrobacterium tumefaciens) was very sev. in a garden in Queens Co., P.E.I. (R.R. Hurst).

SAINTPAULIA - African Violet

Root Knot nematode (Meloidogyne incognita). Plants from a greenhouse in Grimsby, Ont. had rotted roots and swollen areas at crowns and petiole bases. Encysted larvae and a few pear-shaped females with numerous males

were found in the swollen tissue. The species was identified by J. L. Townshend and confirmed by J.N. Sasser, North Carolina State College (W. G. Kemp).

SYMPHORICARPUS - Snowberry

Powdery Mildew (Microsphaera diffusa) was observed causing a sl. infection at Charlottetown, P. E. I. (R. R. Hurst).

Leaf Spot (Phyllosticta symphoricarpi) caused mod. damage at Rimouski, Que. (D. Leblond).

SYRINGA - Lilac

Powdery Mildew (Microsphaera alni) was common at Contrecoeur, (E. Jacques) and Macdonald College, Que. (E.O. Callen). Very common on flowering plants but less noticeable on trimmed hedges at Kentville, N.S. (J. F. Hockey).

Leaf Spot (Phyllosticta sp.) was observed in Quebec City, Que. (D. Leblond).

TAGETES

Yellows (Callistephus virus 1). Caused sev. damage in a Charlottetown, P. E. I., garden where 50% of the plants were infected. (R. R. Hurst).

TULIPA

Fire (Botrytis tulipae). On Vancouver Island 71% of plantings showed early season infection, ranging from 0.2 to 0.5%. Later in the season 83% of plantings were affected. No infection was noted during inspections on the B.C. mainland (N. Mayers). Also noted from Nicolet (P. Duval) and Chamy, Que. (D. Leblond). Sev. infections at late bloom damaged all Orange King plants at Kentville, N.S. (J. F. Hockey).

Mosaic (virus) affected less than 9% of plantings on Vancouver Island and ratings were 0.6 - 0.8% (N. Mayers).

VERBENA

Leaf Spot (Botrytis cinerea) was found causing mod. damage to V. rigida in Quebec City, Que. (D. Leblond).

VERONICA

Leaf Spot (Septoria veronicae) caused sev. damage to V. alpine in a rock garden in Quebec City, Que. (D. Leblond).

VIOLA

Leaf Spot (Cercospora violae) damaged pansy plants sl. at Ste. Foy, Que. (D. Leblond).

ZINNIA ELEGANS

Gray Mold (Botrytis cinerea). Mod. infection occurred at Ste. Foy, Que. (D. Leblond).

Stem Rot (Sclerotinia sclerotiorum). Infection was sev. in several gardens at Fort Garry, Man. Typical sclerotia were obtained from the base of stems incubated in moist chambers (B. Peturson, W. C. McDonald).

Yellows (Collistephus virus 1) was observed on 1 plant at Ste. Foy, Que. (D. Leblond) and on 30% of a planting in flower in Queens Co., P. E. I. (R. R. Hurst).

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